INSTRUCTION IN INDIAN SECONDARY SCHOOLS

A BOOK ON SCHOOL MANAGEMENT
AND METHODS OF TEACHING

EDITED BY

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NOTE

This is a completely revised and enlarged edition of the work bearing the same title, and first published in 1919 under the editorship of A. H. Mackenzie, M.A., B Sc., I.E S., Principal, Training College, Allahabad.

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PREFACE TO THE SECOND EDITION

The first edition of *Instruction in Indian Secondary Schools*, prepared under the editorship of Mr. A. H. Mackenzie, was published in 1919. Since then the demand for the book, which has been reprinted three times, has been constant. This indicates that the book has met a felt need among those concerned in secondary education in India. The success achieved has probably been due chiefly to the fact that the book was written by practical teachers with Indian experience, each well qualified in his own subject, for the benefit of practical teachers in India This essential feature is maintained in the second edition

No last word will ever be said about education During the twelve years that have elapsed since the publication of the first edition changes in educational theory and practice have inevitably occurred. It does not, of course, follow that an idea, because it is new, must necessarily be good. Nevertheless, with the increasing amount of thought and care that is being devoted to education, there should be at any rate a general tendency towards improvement It is hoped that the new edition reflects what is best in modern educational thought.

All the chapters in the first edition have been rewritten except those on School Management and the Teaching of Nature-study, Drawing and Handwork. The book lists following the old chapters have been brought up to date. New chapters have been added on The Dalton Plan, The Teaching of the Mother-Tongue, Physical Education and Scouting. The new edition is thus not only more modern, but also more complete than its predecessor

Each writer is responsible only for his own portion. The Editor's responsibility for the various contributions is confined to general approval, which does not necessarily extend to every detail

E. A. MACNEE

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Chapter I

PRINCIPLES OF EDUCATION

Introduction

'Educational efforts must secure for each one the conditions under which individuality is most completely developed—that is, conditions which will enable him to make his original contribution to the variegated whole of human life as full and as truly characteristic as his nature permits.'[1] In considering an educational ideal such as this, every thoughtful teacher must realize that our schools fall far below it. We find pupils who show great promise on coming to school but who altogether fail to 'make good' as they reach the higher forms; we find others who do well at school but whose school career does not fit them for useful work in later life; and we realize that in many schools there is little scope for originality or for the development of individual powers. Teachers in considering these things wonder how far such failures are inevitable and how far they are due to shortcomings in the child, the school system, or in the teacher himself We look for answers to these questions and for guidance in our works to books on educational psychology. In many different ways psychologists are studying the behaviour and development of children, and the results of their investigations are of practical help to teachers. The purpose of this chapter is to show something of what educational psychology tells us as to the influence of nature and of nurture on the child's development; as to the growth of individuality, and as to the place of the school in relation to the individual and to society.

The measurement of innate ability

The first question that faces the teacher is the extent to which his pupils are capable of profiting by education. In all countries until comparatively recently a literary education was only open to a few men, and all other classes of people (women, manual labourers and primitive races) were looked upon as incapable of profiting by such education. This theory has been shattered by notable successes in different fields of education won by members of all the classes of people previously considered incapable of book learning. These successes have caused a tendency in certain quarters for the pendulum to swing to the other extreme; for all children to be considered equally intelligent, and for the failure of children in school to be attributed entirely to faulty teaching. Scientific investigations, however, tend to show that the theory that all men are born equally intelligent is as fallacious as the doctrine that high intelligence is the reserve of men in a certain social position. Biologists researching in the problem of heredity have established beyond a doubt that variations in innate capacity exist. Education cannot do everything. As Thorndike says, 'the results of our endeavours will for ever be limited as a whole by . . . inborn talents and defects.'[2] The teacher therefore must not expect all children to do equally well at school, but he

[1] Nunn, T P, *Education, Its Data and First Principles* (1922), 5.
[2] Thorndike, E. L., *Educational Psychology* (1903), 44.

must help each child to develop to the full the capacity with which he was endowed at birth. The teacher's difficulty lies in making a just estimate of this 'innate capacity' and in distinguishing between failures that are due to mental defect and those that are due to lack of effort. Here psychologists give us some guidance. An attempt to measure the innate intelligence of children was first made by Dr. Alfred Binet[1] in connexion with retarded children in the elementary schools of Paris He set out to determine how far such backwardness was due to mental defect and how far it was due to unfavourable conditions. By examining a great number of children, Binet evolved a set of questions which were intended to test, not the knowledge that the child had acquired at school, but his innate capacity. Binet's assumption was that there is a time in the life of every child when without any formal teaching he has learnt certain things such as his name, the parts of his face and body, and how to carry out simple instructions He found out by examining a large number of children at which year each of such accomplishments is normally acquired and thus he drew up a list of questions by which each child can be tested to discover if he is of average, superior or defective intelligence Binet's list of questions and method of measuring have been considerably modified by later investigators; but in its revised form Intelligence Tests provide a standard method for measuring ability which, though probably far from infallible, serves at least to mark off defectives from normal children. The advantage to teachers of such investigations is obvious They help them to find out which children can profit by higher studies and which children need a different type of education If the use of Intelligence Tests in India could make people see the need for special schools for defective children it would be a great benefit to society; such schools with the training they provide in unskilled occupations bring an interest and purpose into the lives of many children who would just lag behind in ordinary schools, and drift later into unprofitable or delinquent ways of life. We see therefore that a consideration of the limitations of innate capacity leads to a recognition of possibilities of developing that innate capacity by wise education and training.

Instincts and emotions

While a study of the movement for the measurement of intelligence shows the differences that exist between individuals, a study of instincts shows that certain unconscious tendencies to action are common to all human beings. Psychologists do not agree as to the definition of instinctive tendencies, but they agree sufficiently to show practical teachers how important it is for them to base their teaching on such 'starting points' in education as curiosity, self-assertion, manipulation, etc. It is not possible in a few lines to refer to the instincts in detail, but we can indicate how learning becomes easier if an appeal is made to instinctive tendencies that are common to all children. We can see, for instance, how by giving pupils in an English lesson opportunities for dramatization and for question and answer, the instincts of self-assertion and of rivalry are aroused, and the progress made by the children is much greater than if they were merely passive listeners. The power of the gregarious instinct (making for a desire to be with others and to do as they do) turns a child who is obstreperous and spoilt at home into a law-abiding citizen in a

[1] The description of Binet's work is based on the account given by Nunn, op cit., 109.

school where there is a tradition of obedience and order. All good teaching should make an appeal to curiosity. Dalton Plan assignments giving definite questions and problems meet with a much more interested response than the old ways of giving home work—'Read pages 8-11'. The instinct of manipulation is marked in all little children who wish to handle and play with everything in their reach. Many teachers know the added interest that comes over a class where the boys and girls are given something to look at and examine when they have expected just to sit still and listen. The collecting instinct is strong in children, and boys and girls of nine and ten years of age respond gladly if they are encouraged in Botany to make collections of flowers, and in History to collect pictures from the newspapers.

The instincts, therefore, should be used to promote useful learning, but unless wisely directed it is obvious that they cause unhappiness and harm. They are inextricably connected with the emotions, and the wise control of the emotions is the most difficult thing each individual has to learn. Everyone knows the trouble that is caused in schools by quarrelling and rivalry, by emotional friendships and by anger due to wounded pride. Psychoanalysis shows us how emotional influences in early years affect a man's character and attitudes through life. An experience of bullying, contempt or humiliation in childhood may prevent a boy's character from developing in a healthy and natural manner He may be outwardly submissive with his superiors and compensate himself by dreams of power and importance, or by bullying children smaller than himself; or he may appear outwardly pushing or contentious, this appearance being only a cloak to hide from himself his consciousness of his limitations. An example such as this shows the teacher the very serious consequences that may result from his own thoughtless sarcasm or abuse, or from the stupid bullying of younger boys by older ones. It would be easy to multiply instances in which emotional difficulties have prevented the highest development of the child, but it is important to realize that there is a strong element of emotion also in the nobler side of school life: in hero-worship, in the desire to uphold the honour of the school, and in a willingness for sacrifice and service The very emotions and instincts that often do harm are capable of doing good. self-assertion is the basis of leadership, pugnacity of the crusade against social injustice, and rivalry of the effort to surpass one's own past achievements.

When a boy becomes truly interested in his work there also will be found the basis of emotion. Nunn says, 'the first step in teaching any subject should be to lay the firm foundations of a love for that subject by so presenting it as to tempt the pupil to a joyous pursuit. If this step be well taken and wisely followed up, there is no need to eliminate the drudgery inseparable from any subject worth serious study. The course of true love never did run smooth because it never could; for only difficulty, disappointment and hope deferred can evoke energy that makes a genuine sentiment.'[1] The teacher must give serious thought to the wise direction of the child's emotions so as to help him to become his best. First, he must see that his own influence on the child is good, that he does not through domination or partiality interfere with the healthy growth of the child; secondly, the teacher should have a sense of responsibility for what is going on in the school so as to prevent bad moral

[1] Nunn, op cit, 145.

and emotional attitudes; thirdly, he should try to know as much as possible about the child's home affairs and not treat the child unfairly through ignorance; fourthly, he should try to arrange for the child to have plenty of wholesome occupation, 'a healthy body, plenty of mental occupation, and abundant outlet for physical, aesthetic, social and ethical needs';[1] fifthly, he must satisfy the child's legitimate curiosity and help him to face reality and not to live in a world of day-dreams; and lastly he should hold up an ideal of unselfishness and courage, and help him to turn his emotions to good use.

Habit

Early in the learning process comes the formation of habits. An action that has once been performed is more easily repeated and an action that at first requires an effort comes to be performed after constant repetition without conscious attention, i.e. it becomes habitual. We have all seen little children learning to feed and dress themselves and we know what anxious attention has to be given to every movement. Repetition, however, makes the child better able to control his movements and in time he dresses himself and has his meals with his thoughts full of other plans and fancies. Eating and dressing have become habits. But it must be noted that the child may have learnt to do these actions in a neat and careful way or the reverse. It is in these early years that habits of cleanliness, health and good manners should be established; it will be to the child's lifelong advantage if such good habits become habitual, to his lifelong disadvantage if this is not the case. It was the realization that early childhood is the time for the formation of habits that prompted the wise old definition of a gentleman as 'one who has been trained from earliest years in habits of self-control and consideration for others', and it is for this reason that more stress is laid in modern kindergartens on the learning of health habits (the cleaning of nails and teeth, bathing, the washing of clothes, etc.) than on any book knowledge. The secret of habit formation is constant repetition. It might be expected that the child would object to this, but it will be found that under sympathetic management the child will thoroughly enjoy it. Even the most mischievous children like to follow the established procedure in home affairs and they resent changes that a stranger may introduce. The same principle applies to intellectual habits. Anyone who has watched children in a Montessori class will notice how children will repeat the same activity in the learning process over and over again. This is a very useful characteristic in the teaching of the beginnings of Reading, Writing and Arithmetic. It is necessary that certain things in Reading and Number should be learnt so as to become automatic and habitual, and a skilful teacher will make use of the child's love of repetition in the teaching of these processes. Folk rhymes and stories in every language (for instance, 'The Three Bears' in English) appeal to children by reason of this very use of repetition, and a wise teacher uses such rhymes and stories in the teaching of reading in which new words must be read repeatedly if they are to be remembered. Every teacher would do well to read the famous chapter on habit in James's *Talks to Teachers* and should follow his advice and see that the formation of good habits is 'begun with zest, carried through without a lapse, and rewarded with suitable encouragement'. Some people dislike the thought of being what James calls a 'walking bundle of habits'. But

[1] Norsworthy, N., and Whitley, M. T., *Psychology of Childhood*, 254.

they should remember that the habitual performance of routine affairs is compatible with independence of thought and action where such is called for. If this is not the case, habit has become master where it ought to be servant. It is good to have a habit of taking meals regularly, but it is bad to be unable to adapt oneself to other hours for meals; it is good to have a simple diet, but it is bad to be unable to eat any other sort of rice than that to which one is accustomed. It should be observed, finally, that many habits are based on some strong sentiment or binding social custom and it is useless to try to break such habits without understanding the force behind the habit and using some stronger appeal in the building of a new habit.

Play

Teachers in the old days used to think that play had no place in school. It was only too true that the sort of play that found a place in school was directed to embarrassing the teacher and to preventing his purposes from being carried out But it is now realized that the play spirit is essential for the healthy development of mind and body. The child rehearses in play the serious activities of later life, and play provides the activity that body and mind demand at each successive period of growth, from the random movements of the baby to the skilled movements and intellectual gymnastics of the boy in his teens The wise teacher therefore tries to harness the play spirit for the development of mind and character. The modern kindergarten teacher considers the 'free play' period when children are busy with various self-chosen occupations (woodwork, knitting, playing with bricks, or painting) as one of the most truly educational times in the day. Mr Caldwell Cook in his book *The Play Way* shows how he got the Little Men of the Perse School, Cambridge, to write charming verse, act plays, invent stories and carry through debates all in the play spirit. It was in the play spirit that the remarkable exhibitions of boys' work were planned and carried through at Oundle School.[1] Many a dramatic society connected with Indian schools and colleges is of more real educational value to its members than much of the regular work carried on in the classroom. A project defined as a 'whole-hearted purposeful activity' whether it be building a house or managing a shop is none the less educational for being carried through in the play spirit. Finally, it is in play and organized games that lessons, such as honesty and generosity, subordination to the group and cheerfulness in defeat, are learnt.

It is interesting to try to distinguish between play and work. The teacher's 'You're playing at it; give your mind to what you are doing' suggests that play is half-hearted; but no one who has seen a group of children or a single child at play, absolutely absorbed and indifferent to surroundings, will agree to this. The difference[2] seems rather that in play the interest is whole-hearted and immediate, in the occupation itself and not primarily for any external end; in work there is a conscious end directed by oneself or others that has to be attained. If the work is forced and the purpose of it has no interest for the doer, it becomes drudgery. The ideal for all activities is that the play spirit should actuate the undertaking, but there should also be desired ends which will help one through difficulties. How can we get more play and more of the play spirit into Indian schools?

[1] Wells, H G., *The Story of a Great Schoolmaster.*
[2] Suggested by Norsworthy and Whitley, op cit, 213

First, by demanding more space for the children in our schools. It is difficult for children to develop the play spirit in crowded classrooms and in a school with no playground or playing fields. The children's play should be supervised sympathetically but not controlled from above. This suggests the second requirement, if play is to be encouraged in our schools, which is that the teacher should himself have something of the play spirit and join in the children's games. In the classroom, too, something of this spirit may have a place and there should be an opportunity for the teaching of Art, Handicraft and practical work, which enable many children to give expression to the play spirit more fully than in other classroom activities.

Imagination

Closely connected with play is the subject of the child's imagination. We have all seen children playing at shops, weddings, journeys or bandits; in fact, living out in play the things they have seen around them or about which they have read. A study of children's play makes an interesting study in the development of imagination. The development of a child's imagination may also be traced in his day-dreams. These are not revealed to grown up companions but they have a very real place in the life of the child and of many adults also. In his book *The Day-dream* (based on a study of English children's day-dreams) Mr. Green shows the way in which day-dreams change with the development of the child. They reveal to us the child's desires and his difficulty in adjusting himself to the conditions of actual life. Many lonely children at the age of three or four have an imaginary companion whom they can manage and order about as they please (a means of satisfying the powerful instinct of self-assertion) and they later learn with some difficulty to play with ordinary children who are less amenable. From the age of ten the day-dream represents the child as the heroic leader of a group that is out in search of adventure. This in fact as well as in fancy is the age of group activities, but in practical life the child has generally to be willing to follow as well as to lead, and the desire for self-assertion has to be subordinated to the gregarious instinct. Books and entertainments that fit in with his day-dreams have a strong appeal at this time and stories of daring exploits are popular. The success of the Scout and Guide movements points to the fact that they meet a real need in children's lives. The joys of belonging to a patrol (which again is part of a great international movement), of camping, of uniforms, ceremonies and badges, and of abundant adventurous activity, answer to the wishes expressed in the child's day-dreams and at the same time help the child to get adjusted to the conditions of life as it really exists, submitting his will to that of others. The coming of adolescence brings the day-dream of romance. The boy grows impatient with things as they are and retires to an imaginary land where everything is splendid. He is often impatient of authority at home and at school, and moody and difficult to deal with. He questions established customs in religion and society and he longs for something more heroic. It is important that he should be helped to face things squarely and that there should also be some outlet for his idealism. In the matter of sex, of religion, and of society he is ready to respond to an idealistic appeal. He should have an outlet for this idealism and be able, for instance, to help in some form of social service to bring in the better society. An appeal should be made also for self-discipline as a preparation for service to his community

or nation. It is regrettable if boys and girls stop short at their day-dreams and have no means of fulfilling their desire for service, hardship and adventure.

Poetry, music and art play an important part in the education of the imagination. They express the unrealized longings of men, and in appreciating what is beautiful we in a measure recreate the beautiful ourselves.[1] There is too little opportunity for such appreciation in most Indian schools. Even in the study of poetry the imaginative appeal is lost in the mechanical memorizing of words and comments. The poem should be identified with the pupil's own experience, as in the case of an Intermediate student in Madras who confessed that when reading about Adam in *As You Like It* she always thought of the old college carpenter, and a Secondary Training student who pictured Wordsworth's Michael as like an old shepherd in her own village. In these cases the difficulty of the foreign setting was overcome, but it is also possible to avoid the difficulty by studying the literature of the boys' own mother-tongue, or the writings of Tagore and Sarojinu Naidu in English. Better still is it when imagination finds expression in actual creation. 'Let boys and girls make things under conditions that stimulate the natural flow of energy, let their social surroundings be free and happy, let them acquire by pleasant recognition the mastery that enables them to play with their materials and beauty will inevitably appear, though in varied measure in the things they create.'[2] It is a happy thing for Indian schools that efforts are being made in various places to introduce in school the handicrafts (weaving, design and carvings) that are part of the cultural heritage of India.

But it must not be thought that imagination is only used in subjects such as poetry and the arts. The farmer, the builder, the cook and the teacher all need imagination in their own fields of work. It is not a process dealing with unrealities but a process essential for the activities of practical life. Imagination, as defined in books on psychology, is a regrouping of former images (the memory of things previously seen, heard or experienced by the senses). A cook may imagine a new dish but it must be made up of ingredients previously known to him; a man may plan to build a house but it will be built of materials already known In the imaginative planning of something to be constructed, the correctness of our imagination is put to the test when the thing is actually being made and we discover how correct our images were. Imagination is dependent, therefore, on the variety and correctness of our images; the cook will only be successful in so far as his images of the ingredients he uses and the conditions of their use are correct; the builder's success will depend on his knowledge of his material substances, the principles of building, soil, climate, etc. Part of the value of handwork in schools is that it should give an opportunity for the child to test the correctness of his images. Many a little girl has found out that the pretty doll's dress she has made is too small to put on the doll for which it was intended, and amateur carpenters find that the bookshelves they have made do not fit together. Wise teachers realize the value of such discoveries and that much of the reason for handwork is lost if the pupils merely copy

[1] 'To lead pupils to appreciate is not merely to lead them to admire or to take pleasure in a beautiful thing but to make them in a sense become its re-creators.' Nunn, op cit, 193, note.

[2] Nunn, op cit, 80.

exactly the design given by the teacher. A rather different type of imagination that we all need to use is one that deals not with material things but with the actions and feelings of other people. Sympathy is the power to imagine other people's feelings by a regrouping of our own past experiences. We may fail to sympathize because the experience which occasions the joy or sorrow is unknown to us, or more often we fail to sympathize because we do not trouble to use our imagination. It is important that children should be encouraged to use this type of imagination just as much as the imagination which is dependent on previous sense experience.

Observation

In connexion with both play and imagination reference has been made to the desirability of giving children an opportunity to increase their experience of material things by touching and using the things in their environment. Further opportunity is given for such sense experience in handwork lessons, laboratory work in science, and in excursions, railway journeys and visits to museums or factories Many Indian children have had little opportunity for such observation (by which is indicated the use of all the senses, not merely the sense of sight) yet by such means their imagination is enriched, varied interests are developed and their power to control their environment increased. Teachers sometimes overlook the fact that observation has a physical basis and that failure to observe correctly may be due to physical weakness or defect. Many pupils are handicapped in their work by defective sight or hearing when medical attention or simply a re-arrangement of seats would make things easier for them. Inexact observation is however still more often due to lack of training than to sense defects. It is important that teachers should help their pupils to observe exactly and intelligently by discussion before and afterwards about the points of interest in the things observed. In Nature Study even little children can be led by careful questions and directions to find out much about a flower that they would certainly not have noticed if their observation had not been guided. Each child can examine the specimen and discover for himself the answers to questions written on the board, and what he learns will be of much more value than if he had been told it by the teacher or by other children. The bad speller may be encouraged to 'take another look' and to correct his mistakes. In Art teaching emphasis is being put on memory drawing, where the pupil observes the object (for instance, a water pot), draws it from memory and again observes the object with the purpose of correcting his own work. In each of these cases observation is directed and purposeful, and with a sympathetic teacher it has behind it the child's desire to learn something for himself. One of the secrets of good observation is *interest* in the thing to be observed. The well-known question as to what a *dhobi*, a bootblack, a doctor and a detective would observe in the people on a station platform indicates how *interest* controls one's observation. If therefore we wish our pupils to be observant we should help them to have varied interests and observation will follow of itself.

Attention

Observation is part of the larger question of attention which for many young teachers ('How can I make the children attend?') is of pressing importance. The teacher delivers a lecture on the lines that he has recently heard at college and he is surprised that the children, instead of taking notes eagerly, are either bent on mischief or

busy with their own concerns. If he is a discerning teacher he will soon find that one secret of keeping the children's attention (as a study of instincts should show him) is to keep them busy. If they have a part to take in the lesson, even if it is just setting and answering questions, they will be much more interested. Individual or group methods do much to help teachers with this problem of attention. If children have to find out things for themselves they will work busily, provided the questions are framed in such a way as to stimulate their curiosity and interest. Everyone who visits a good Montessori classroom for the first time and sees all the children busily employed with their own bits of work is amazed at their quietness and concentration, and contrasts this state of affairs with the old-fashioned Infants' Room with its rows of wriggling children and the teacher shouting at them. A similar result is brought about in higher forms when individual methods are skilfully used. If we consider attention carefully we shall see that there are different types of attention: spontaneous attention, according to which we attend without effort to what appeals to our interest; and secondary attention, in which the compelling motive is not our interest in the object of attention but something else that influences our attention. We should aim more and more at arousing spontaneous interest in our schools in India. The foreign medium of instruction, the foreign nature of much of what is taught (Literature and History especially), the lack of apparatus for practical work in Science, the neglect of physical and aesthetic education, have all made it difficult in the past to arouse spontaneous attention, but these characteristics of Indian education are gradually being changed. Motives compelling secondary attention are fear of punishment, desire for approval and most of all desire to pass examinations. The 'examination motive' cannot but influence students powerfully in all parts of the world, but it has very real dangers inherent in it. Verbal memory comes to be regarded as more important than independent thought, and consequently the pupil is tempted not to think about what he learns but just to memorize words which are forgotten after the examination. We must not forget that, as Professor Kilpatrick points out, in all our learning we are acquiring not merely information but attitudes and character. In cramming for an examination we are building attitudes that are valueless or even harmful. Teachers in India who have an interest in building up a strong nation have a serious responsibility to encourage pupils to think for themselves and not to depend on notes and model answers.

In educational circles there has been a controversy about the place of spontaneous and secondary attention in education Professor Dewey, in his book *Interest and Effort in Education*, has shown most convincingly that an appeal to the pupil's interest does not mean that the child will put forward no effort. A true and deep interest, on the contrary, makes anyone, be it child or adult, ready to do hard work that they would never undertake otherwise. A class of Indian girls, who objected strenuously to learning a passage of Shakespeare by heart on the score of lack of time and the approach of examinations, were more than willing to learn long passages of Shakespeare for a dramatic performance. We have all seen the persistence and effort that a boy will put into working at a hobby; and the achievements of great men (Ramanujam, Sir Jagadis Bose) are the products of spontaneous interest

carrying them through much laborious toil. While there is a strong case for appealing to the spontaneous interest of children, many of us are convinced that even in an ideal school the children would have to work *without* spontaneous interest at times. Sometimes the effort of doing what we do not like is rewarded with a growing interest, and sometimes we are learning the lesson that was once described as the chief thing school should teach us, 'to do what we do not like with as much thoroughness as what we do like'. In any case work without interest will only be valuable eventually if such compulsion and discipline comes from within as well as from without, and an ideal of duty comes to govern our life.

Imitation

One of the most important factors in education is the force of imitation. Instinct prompts the child to speak and eat, but imitation determines the language he shall use and his method of eating. The importance of early training in habits has already been pointed out and it is equally true that the manners and morals that are the models which we imitate in childhood have very great influence on our later lives. Imitation has an important place in school life also. A boy wants to dress and behave like other children at school, and this may be a great force for good in the training of his character. If a boy comes into a school where honesty and healthy-mindedness prevail it will greatly help him to establish those characteristics in himself. Professor Graham Wallas says 'half-conscious imitation . . . makes the greater part of class-room discipline,'[1] and it is of great help to a school if a tradition of orderliness has been established. It is obvious that a teacher, especially a headmaster, has great influence in establishing such a tradition and he himself is likely to exercise a strong influence through the force of his personality. The good that is done by a great and wise teacher, like Dr. Miller of the Madras Christian College, is incalculable; but we must not forget that the domination of a strong, even though a good personality, may not be altogether beneficial. The teacher must not use his influence for his own gratification and he should be careful not to impose his opinions on his pupils. For adolescents imitation is closely connected with the tendency towards hero-worship and this, especially in the case of girls, may be of an undesirably emotional nature. Even at the best it is obvious that imitation alone is an insufficient force in the development of character. Each boy must be himself and not a copy of someone else or merely typical of his group, and it is important that a boy should be encouraged to criticize and judge for himself, and not condemned if he disapproves of all the accepted order for a time

Memory

Much time in school is given to the memorizing of facts and this will probably always be the case. Teachers therefore need to know how and what their pupils should memorize. Books on education tell us that our pupils should learn what they can understand and enjoy now and what will be interesting to them later. This means that we should teach sums dealing with home expenditure in rupees, annas and pies rather than sums in pounds, shillings and pence; the history of the local fort or the constitution of the local Council rather than the battles of the Wars of the Roses, and the study of grammatical rules in as far as they help one to speak correctly and not as a scientific study unapplied to life. These look

[1] *Human Nature in Politics*, 28.

like truisms, but much of our teaching and of our emphasis in what we teach would be altered if we actually applied these principles in the classroom. The difficulty for many teachers is that they have little freedom of choice as to *what* they teach since the syllabus is set for them; the only choice that rests with them to make is as to the *method* of teaching Here psychologists tell us that we should practise the thing we are learning in the way we shall later need to use it; i.e. in teaching spelling we should get our pupils to write the words, not say them, as in later life they will generally need the power to spell correctly in the written, not the spoken language; in reading we should put more emphasis on silent than on oral reading, as in later life we shall more often need to read to ourselves than aloud to other people. Young teachers are apt to think that when once a child has learnt and known a thing, he ought to always remember it. But experience shows us that constant repetition and 'over-learning' are necessary if the subject is really to be grasped and retained in memory. This is true of adults as well as of children and it is good for a teacher to learn some new subject (for instance a new language) and to notice how he himself, like his pupils, forgets the meaning of a new word over and over again Investigations also show that we learn more quickly a subject that has an intelligent meaning and purpose for us and when the learning of it has a pleasant result. This brings us again to the importance of building on children's interests and of giving a purpose to what they learn. Memory and the retention of a store of knowledge are essential for men in all walks of life—a doctor, a lawyer, a scientist, a merchant, all need to have a knowledge of a large body of facts if they are to do good work, but this mastery of facts is subservient to their aim of being successful in their profession or business. However brilliantly our pupils may do in examinations, our teaching is a failure if our pupils just learn facts for those examinations and never think of them again. E. Raymond in an entertaining account of the best schoolmaster he ever knew, describes him as saying to his pupils: 'I do not want to teach you to *know* but to *interpret*, see? Any fool can *know*. Wisdom comes when you begin to interpret. Your brain shouldn't be a cold-storage chamber but a power house.'[1]

Thinking

The final test of a teacher's success or failure lies in whether he has taught his pupils to think for themselves. If we merely memorize facts they are useless in our lives; if we consider them in relation to our needs, modifying our ideas in the light of these new facts, they are indeed a 'power house', building up mind and character. It is sometimes said that it is useless to try to make children think for themselves before adolescence, as the power of independent thought is only developed about that time. But if we accept the definition of thought as 'following up and testing the conclusions suggested by the facts and events of everyday life',[2] we can see that even in infancy the discovery that the back and front views of people though so different belong together is the beginning of thought. One cannot watch an intelligent child three years old without noticing the part that thought and planning take in his activities—trying again and again to get a picture puzzle right until he is satisfied, and asking all sorts of

[1] *From Literature to Life.*

[2] The definition by Dewey is found in Norsworthy and Whitley, from whom the illustration is also taken, op. cit., 170.

questions about things that bewilder him. Older people often find the child's early attempts at thought tiresome: they tell him to stop asking questions and finish the picture puzzle for him, and they do not realize that by so doing they are hindering the child's development in intelligence and skill. In just the same way at school, teachers often fail to use opportunities for making their pupils think because they find it easier to make them memorize facts. A good teacher on the contrary tries in every lesson to make his pupils think and judge for themselves. In History they may learn to seek for truth by comparing conflicting evidence in historical documents or in modern newspapers; in Literature they enter into the lives of other people and learn to judge character and motives; in Mathematics they work out problems in expenditure and measurement such as might confront them in actual life; in Nature Study they try to make simple investigations or, for instance, a study of influences actually needed by plants to make them grow; in Handwork they may work out a project such as the making of a pencil case, finding suitable materials and adapting them for the particular purpose; in Geography they trace the influence of climate and natural causes on life in different countries. School activities outside the regular lesson periods, such as entertainments and excursions, should also give children an opportunity for planning and making decisions, and any form of self-government puts responsibility for thought or judgement on the children. An educated man or woman should be characterized by his or her power of independent and unprejudiced judgement. We are all too apt to take our opinions from the newspapers we read and the group in which we move, and to see things as we wish to see them, not as they actually exist. If we can train children to think for themselves we shall be doing a true service to the community.

The growth of the self

We have referred to some of the many aspects of a child's growth and development, but we must not forget that the growing self is one, and that the child cannot develop aright unless there is an underlying unity, linking together all sides of his life. We saw in the development of the imagination how a child has to reconcile his desire for self-assertion with life as he finds it, and this problem of adjustment faces every human being. It is only a perfectly harmonized character that attains complete adjustment and such a person has a *childlikeness* and sincerity that are quite different from the *childishness* which keeps in adult years the methods and tempers of youth. Perhaps it lies outside the sphere of education and in the sphere of religion[1] to make possible such complete adjustment but the school has some responsibility in bringing it about. Dewey in *Democracy and Education* refers to this specially. He writes: 'The school has the function also of co-ordinating within the disposition of each individual the diverse influences of the various social environments into which he enters. One code prevails in the family; another on the street; a third in the workshop or store; a fourth in the religious association. As a person passes from one of the environments to another he is subjected to antagonistic pulls and is in

[1] 'Religion exists at all because men find themselves and their world standing over against each other in an antithesis, even opposition, that needs to be resolved The religious impulse is thus towards the progressive unification of the man with himself, his fellows, nature and all that is It is man's effort to be at home in his world and with himself.' Coe, G A, *Education in Religion and Morals*, 200-201.

danger of being split into a being having different standards of judgement and emotion for different occasions. This danger imposes upon the school a steadying and integrating force.' It is exactly in this connexion that Mr. Arthur Mayhew feels that Indian education has failed. He points out that there is frequently a complete separation between the interests of home and of school. The religious and social customs that have supreme importance at home have little influence at school, with the result that the pupils have divided loyalties, their deeper and more intimate interests being centred on things altogether unconnected with the school.[1] Many factors make it difficult to prevent this separation altogether, but it is surely possible for it to be lessened by making school studies more varied in their appeal and less foreign in character, and by bringing about friendly contacts between teachers and parents.

The growth of the self depends ultimately, however, on the child himself and on the ideals that govern his life. Some teachers and parents have mistakenly tried to plan their children's lives for them and to mould them to their will. This is not right, the child must work out his own ideal, and teachers and parents should help but not dictate. Their part is to see that the child comes into contact with what is good and beautiful in free and natural surroundings where he can be himself and know that he is appreciated and not despised. Everyone, whether child or adult, is more likely to do his best if he is in the company of people who expect such best of him; and many a child does badly at school because he is never expected to do otherwise. A child's ideals have considerable influence on the development of his personality. Every child has plans and ambitions which dominate his interests and activities; at one time he may long to be a great lawyer making vast sums of money and attracting crowds to listen to him by his eloquent pleading; at another time he will want to be a great politician influencing masses of people and shaping the future of his country. The wise teacher will not be unmindful of these ideals, but will use them as a motive power in his work He will also put the boy in the way of considering other possible ways of life, as it is by the criticism and comparison of various ways of life that our final ideal is attained. Not all men, however, are able to realize their own dreams regarding a life work. Many have to be satisfied with something quite different from what they would have wished. Education should furnish these less fortunate ones with inner resources and with a realization that even monotonous work is contributing to the good of the community.

The school and society

The ideal 'work of each for weal of all' is one of the lessons that a boy should learn through life at school, but it is all too common for a boy to leave school without this community sense and without a realization of his responsibility for the maintenance of order. He should realize that the happiness of the community depends on the good-will of each member of it, and that rules are something necessary for the common good and not something imposed from without. He will learn this the more readily if he has some responsibility for making rules and for dealing with offences against them. As for the teacher his attitude towards rebels will not be that of an autocrat whose personal will has been flouted, but rather

[1] *The Education of India.*

the attitude of the one chiefly responsible for the maintenance of a customary order on which the convenience of all depends.[1] In a school where punishment is constantly required the wise teacher will also consider whether the reason for it does not lie in the teaching or curriculum and in the conditions of life in the school. Another lesson that the common life of school should teach is that the good of a community depends on honesty and mutual trust; that educational standards are meaningless unless they are made to apply to all alike, and that 'hard cases make bad laws'.

It should be noticed that these 'civic' virtues and other ideals and attitudes learnt at school are learnt best not by learning *about* them but by practising them in the school society. This is impossible if a school is merely a place where classes are held and instruction is given; it must be a place where the pupils share a common life and are inspired by common ideals. They must be given an opportunity to play and work together, learning to shoulder responsibility for games and school societies, for the editing of a school magazine or the management of a co-operative store.

Schools have an important contribution to make towards the development of national life. They should be a link between the past and the present, helping to conserve what is best in the history and culture of the community, rejecting what is exclusive and outworn, and building for the future. Indian schools should have something of the spirit of the ancient forest schools, keeping the personal link between teacher and pupil and the respect in which the teacher was held; but they should have something also of the modern spirit, being open to all communities and introducing children to science and art, that are the heritage of the whole world. To achieve such an ideal in Indian schools men and women of various gifts are needed. Scholars must research in many fields before the history, literature and natural lore of each district can be presented in a living yet simple manner to children. Sociologists and psychologists must investigate the special needs of Indian children before those needs can be adequately met; and most important of all, men and women of character with a genuine affection for children must choose teaching as their vocation, whether it be in city high schools or in isolated villages. The disadvantages of a teacher's life, monotony and poor pay, are all too obvious, but the human interest of the work and its importance for national life must also be remembered. It rests with the public to see that teachers in the schools are adequately paid, and with the teaching profession to uphold and carry forward the traditions laid down by pioneers such as Gokhale and Rabrindranath Tagore.

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[1] Adapted from Nunn, op cit., 61 and 202

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CHAPTER 2

SCHOOL MANAGEMENT: ITS PRINCIPLES AND PRACTICE

UPON the management of a school hangs its success or failure. However good the teaching is, however large the number of pupils, however highly qualified the staff, unless the management is good, the school is more than likely to fail eventually in its object. What is the object of a school? It is to train its pupils to be loyal, honourable, useful, healthy citizens, capable of taking their share in the work of the wider world.

The passing of examinations, for which the pupils have been 'crammed' for seven years until their brains are swollen with a superficial knowledge of a large number of subjects, should not be the main object of a school, and it is important that the headmaster should recollect that the tone of a school and the character and physique of the boys are matters to which he must turn his attention as well as to the result-sheets of public and school examinations.

The subject of school management naturally falls into several divisions, which will be taken in order, and these divisions are as follows: The headmaster, the distribution of the staff, the supervision of the staff, teachers' records, staff meetings, classification of pupils, examinations, time-tables, home work, parental co-operation, corporate life, hostels, and games.

The headmaster

The old idea that a headmaster was a form of ogre, who lived in his office, was armed with a cane and was ready on the slightest provocation to inflict terrible corporal punishment, has been exploded, and we find nowadays that the ideal headmaster, though retaining a dignified superiority over the whole school, is to be approached by the youngest boy in the school with impunity, is ready to listen to complaints from master, boy or servant, to sympathize and to tender advice. He endeavours to learn the names and characters of all the boys under his control and to join in their sports, or at any rate to show his interest in their sports by being present as often as possible on the playing-fields. A headmaster soon finds out that much more can be done by kindness than by severity. A boy very readily understands that a *request* from his headmaster is equivalent to a *command*, and a boy is prouder of doing what his master *asks* him to do than what he *tells* him to do. This may sound heterodox, but it is none the less true all the world over. Nothing can be lost, everything can be gained, by studied courtesy on the part of a headmaster. So much for his relationship with the boys.

In his relationship with the staff much the same remarks apply. It is through him that the staff are going to gain advancement, and it is of course one of the duties as well as one of the pleasures of a headmaster to do his very utmost for the staff under him. This matter will be referred to later on. His relationship with the first assistant is a somewhat special relationship. The first assistant is his right-hand man and he naturally relies upon him

more than upon any of the other masters; but the first assistant must be careful not to presume upon his position. Any friction between the headmaster and his first assistant, arising out of a feeling in the mind of the headmaster that his first assistant is usurping some of the powers of the headmaster—and this is not uncommon—is fatal to the interests of a school. The exact duties of a first assistant should be laid down in writing so that there can be no mistake about them, and the headmaster should arrange that his duties and the duties of the first assistant should not overlap.

A headmaster has to remember that 'a house divided against itself cannot stand'. He has therefore to watch the bearing of each master towards the others and towards himself, and to take care that no discordant element is allowed to exercise a prejudicial effect upon the school. In this country, where caste is inclined sometimes to influence a master against his better feelings, the preservation of harmony is a real difficulty to the headmaster of a school, and caste prejudice is allowed to prevail not only between master and master, but between master and boy, a state of things as productive of bad discipline as it is ridiculous. A headmaster should keep his eyes open for any discord, and should quell it immediately by private conversation and by his own example.

One of the troubles which dog the path of a headmaster is his inspection by a superior officer. As a matter of fact, rather than feel anxiety, almost amounting to fear, about this visit, he should welcome it as an opportunity of setting forth his doubts and difficulties in the receptive ear of the inspector or director, and of advancing his own theories on what might be done to make the school more efficient. An inspector is not paid merely to find fault. Anybody can do that. But he is paid also to offer help and to see with his own eyes what improvements can be made in each school with the money at his disposal, and he is always ready to listen to any proposals a headmaster can make and to give them the fullest consideration.

A headmaster must also retain cordial relationship with the parents and guardians of his boys. He should endeavour by every means in his power to secure their goodwill and confidence, as far as this is possible without weakening discipline or sacrificing what he believes to be best for his pupils.

To sum up, a few general hints are herewith appended, by following which it is hoped that the rough places in a headmaster's work may be made smooth:—

1. Be in life and character a pattern to the staff and to the boys.
2. Remember that the passing of examinations is *not* the be-all and the end-all of school life.
3. Be dignified, but sympathetic.
4. Request rather than command.
5. Assist loyal colleagues.
6. Eliminate discordant elements.
7. Regard the inspector as your friend.
8. Secure the confidence of parents.
9. Do not find fault with a master in the presence of the boys.
10. Show interest in the outdoor life of the pupils either by joining in the games or by being present at them.

The distribution of the staff

The distribution of the staff must depend largely upon the abilities of the members, but a few broad principles can be laid down. The staffs of most high schools in India are composed of men very much alike The majority have been through the same seven years' drudgery, and any attempt on their parts to break out in a new line, any tendency to be original in any way, has too often been nipped in the bud and sternly repressed Not infrequently a boy has but to show a tendency in the direction, say, of engineering, and he is marked, a boy to be watched and prevented from any further indiscretions. No! he has to go through the high school mill and woe betide him if he comes out at the other end different from his fellows. The result is a collection of men, many of whom are almost similar in tastes, aspirations, abilities, etc., endowed with a considerable amount of knowledge, and the lucky ones with a gift of imparting that knowledge to others, coupled with a love for boys. Some of these men decide to take up educational work from love of teaching and of boys. With those a headmaster finds no difficulty. Others take it up because they feel that they must earn their own livelihoods and no longer remain a drain upon the family exchequer. There is no harm in this, provided they are fond of teaching and fond of boys, and many of these masters soon find that they have adopted a very fine profession, and in the end, by study of the subject and applied intelligence, turn out excellent masters. There are others, however, who take to teaching solely to earn a living or to support themselves while they are studying for some other profession, e.g. law, and who have little or no interest in their work as teachers. These men present difficulties to a headmaster, first, because their hearts are not in the work, and secondly, because they are seldom good disciplinarians. Fortunate is the headmaster who can eliminate such as these from his staff.

The university course does nothing to teach a man how to become a good and effective teacher. A college professor is, as a rule, not a teacher, but a lecturer, and listening to a lecturer does not assist a man to teach a class in the smallest degree. Hence a schoolmaster has no experience of teaching before he presents himself as a candidate for a temporary vacancy in a high school, except what he has been able to pick up from his own teachers when he was at school.

There are only two places where he can learn the art of teaching, and those places are the secondary training college and the actual school in which he is a master. It is possible that masters deputed to training colleges enter them with a wrong idea as to what the college is going to do for them. The college authorities do not guarantee that what is raw material at the beginning of the course shall be the finished article at the end. What they do guarantee is that masters shall be put on the right road, shall be shown how to overcome the mechanical difficulties of teaching, and shall be given an interest in, and the right attitude towards their work; masters must clearly understand that the knowledge of method, school management, psychology, etc., gained by them at the college will not make them teachers unless they have that belief in the value of their work and that living interest in it which will make them extract joy even from the drudgery of its details.

Training colleges are doing an immense amount of valuable work, and

students therein derive very great benefit from them, but they must not be looked upon as an end in themselves. They are merely a means to an end. The work of the training college should be completed in the school in which the teacher begins the practice of his profession. He has to learn in the actual work of teaching how to apply the principles which he learnt as a student. He should refer his difficulties to his headmaster or to his more experienced colleagues. Few do this, partly from a desire not to trouble their fellow men, partly from a feeling that by asking help they confess their weakness

So the staff consists of a collection of men, some trained in a secondary training college, some untrained beginners, some zealous teachers, others awaiting a transfer into some other department, some young and athletic, others just doing their bare work until the day arrives when a full pension falls due, and the question arises how to employ these men to the best advantage The main principle to follow is. Give the younger boys the best teachers and the best disciplinarians It is fatal for a young boy when he first enters a high school to be put into a class where the teaching is dull and the discipline poor. The best 'direct method' teacher should be put in charge of the lowest standard, and it is his duty to play upon and take the fullest advantage of a boy's feverish energy and excitement at being at last admitted into the great high school. Those masters who have specialized in Mathematics, Vernacular, or Science, will naturally take the higher classes in those subjects, but headmasters, in distributing the staff, should not be deluded by a master who declares that such and such a subject is his 'special' subject. It may be so; but it often occurs that the master cannot teach it. Experience shows us that a man who is particularly good at a subject is sometimes unsuccessful in teaching it from the mere fact that he cannot appreciate his pupils' difficulties, as they are no difficulties to him. So, after putting the most learned of the staff in charge of the two highest classes and the lowest classes in charge of the best 'direct method' teachers and the best disciplinarians, we are left with the middle section in charge of the weaker masters; and it is in these classrooms that the headmaster will spend most of his time

Specialists or class-teachers

In distributing the staff the question arises whether it is better to make a particular teacher responsible for all the work in the same subject in several classes or for the work in several subjects in a particular class. Provided the master in question has a special knowledge of a particular subject and is a good teacher, the former plan is preferable in the higher classes. The specialist, being confined to the subject in which he is interested, is likely to extend and deepen his knowledge. If he is given a special room for his subject he takes a pride in providing it with materials which will help him to add interest to his lessons: if a 'Geography man' he furnishes it with maps, pictures, photographs, models, etc.; if a 'History man' with coins, time-charts, reprints of old records, etc The danger of the specialist is that he is apt to shut himself off from his colleagues and to isolate his subject from the rest of the school curriculum; the headmaster can to some extent obviate this by requiring the specialist to arrange his syllabuses of class and home work in consultation with other teachers. In the junior classes, where correlation between various subjects

is more desirable and practicable than in the senior classes, the class-teacher system is preferable.

Supervision of the staff

The amount of time at the disposal of a headmaster for the purpose of supervising his staff varies in different schools according to the amount of office work to be done and the number of teaching periods the headmaster reserves for himself. As the supervision and guidance of the staff is of supreme importance a headmaster finds himself obliged to curtail his teaching periods and reduce his office work to a minimum. This reduction of office work can be effected by delegating certain portions of the work to the various members of the staff, and by setting aside a part of each day for the submission of all applications from masters, boys, and parents. This should leave a headmaster three hours or so for supervision.

He must first satisfy his masters that he supervises them from the right motives. He is there to listen to the doubts and difficulties of a master, to solve them if possible, or at any rate to offer suggestions for their solution. He is *not* there merely to pick holes in a master's teaching, but to help him by virtue of his riper experience to solve difficulties, and he can often offer exactly the solution for which the master has been searching possibly for years.

One of the most important subjects a headmaster has to supervise is Writing. The writing in India appears to be on the whole very bad and extraordinarily careless and untidy, in spite of the fact that Indian boys have really an infinite capacity for taking trouble. The ' rough copy ' should be banished from the classroom, and teachers should insist on all writing being done with reasonable care and neatness. The headmaster can considerably raise the standard of writing in his school by requiring each completed notebook to be brought to him for inspection before a new one is issued; a brief remark on the cover of the new book regarding the work in the old one will act as a stimulus and will enable him to judge of the progress of individuals.

Another important subject for supervision is Drawing. Drawing in the junior and middle classes in most high schools is compulsory, and the Drawing periods are really unique opportunities for self-expression on the part of the boys and should be regarded as such by the Drawing masters, who are only too often satisfied with inferior results. This subject, however, is dealt with in a separate article.

In other subjects the headmaster has to see that his assistants are working at a sufficiently rapid pace to get through the full amount prescribed by the end of the year, to see that the teaching is practical, that facts are presented vividly to the pupils, that incorrect answers are not allowed to pass, that *all* the boys are questioned and not only the three top boys in the front row, that the teaching is sufficiently loud to admit of the boys at the back of the room hearing quite distinctly, and not so loud as to interfere with the teaching in the next room, and other matters of a similar nature. He should also make a point of exacting a reasonable standard of care and neatness not only from the students in their notebooks, copy-books, etc., but also from the masters on the blackboard. If the master writes untidily on the blackboard it is more than likely that the students will write untidily in their notebooks.

It is a good plan for the headmaster to keep a book and enter in it the suggestions he finds it necessary to make to the masters, and periodically to see how these suggestions have been carried out. This matter is referred to further in the paragraph 'Teachers' records'. A headmaster by this means will be able to ascertain which of his masters are the best, and will be able to give the Inspector direct proofs of their capacity, willingness, energy, and so on.

It is of the utmost importance that a master should not be lowered in the estimation of the boys, so that a headmaster must in no circumstances whatever administer a reproof to a master in the presence of the boys. There is no objection to his correcting a master in the matter of facts of his teaching or the pronunciation of English words, etc., but reproofs must be kept for the office, or there will be fatal results.

The records which a master should keep are five in number, viz.

Teachers' records

1. Attendance register.
2. Mark register.
3. General and detailed syllabus of work to be done.
4. Diary.
5. Class notebooks.

In all class registers the pupils' names should be entered in the same invariable order. This prevents mistakes when marks, attendance percentages, etc., are transferred from class records to school records.

It is unnecessary to remark on the keeping of attendance registers, as detailed instructions for filling them in are given in the various provincial educational codes. Extreme care should be taken to carry out these instructions. These registers are a test of a master's honesty.

With regard to the mark register, a master must be careful to enter up the marks of each boy in his register punctually, and should date the entries, being careful to see that the dates in his register correspond with the dates in the boys' notebooks. It is not at all necessary to give marks to a class daily, and the simpler the system of marking the better. The use of small numbers is strongly recommended, and marking up to a maximum of five is preferable to the use of colourless words, such as 'fair' or 'moderate'.

With reference to the syllabuses of work to be done, a master must realize first of all that it is essential for him to be systematic in his work if he means to do the whole work prescribed for the year, and in order to be systematic he must at the beginning of the year lay down for himself a syllabus of the year's work in outline and at the beginning of each term a detailed syllabus for the term These syllabuses are not only of great assistance to the master, but of considerable interest to the students, who, if they find they are behindhand with their work, are spurred to further efforts.

His diary might, with advantage, be in the form which is in use in the United Provinces—a form which compels each master to show week by week exactly how much work in each subject his class has done, and provides a column for 'remarks' by the master himself and another for the remarks of the headmaster or inspector. A comparison of the detailed syllabus with the master's diary would show the headmaster at a glance whether the master

is working according to the syllabus or not. Appended is the form of diary recommended :—

DIARY

Date Week ending :	*Amount taught*	*Notes by the Teacher*	*Remarks by the Headmaster, or Inspector*

The class notebooks have advisedly been included amongst the teachers' records, because it is by means of them that a master's work is largely judged. If the written work of the class is untidy, if it has not been properly corrected, dated and marked, and the marks have not been entered in the register, then it is clear that the master has not been doing his duty. A master, therefore, cannot be too careful about these notebooks. He must also remember that an inspector will require to see all the written work of a class, not only a few specially tidy exercises done on purpose for inspection.

Staff meetings

The importance of staff meetings is great or small in proportion to the amount of discussion of school matters they provoke. A staff meeting where the headmaster delivers a harangue to the assistants and the first assistant gets up afterwards and seconds the remarks of the headmaster is of very little value. In some schools a staff meeting is held once a week as a regular thing, and at times it must be most difficult to think out any subject to discuss. This is overdoing it, and probably the best arrangement would be to have a meeting once a month, at which any master might air his opinions on any subject. A few days' notice of the agenda should be given so that every one may come fully prepared to ask questions or to give his views. The importance of such meetings cannot be over-estimated. Additional meetings during which the headmaster can deliver his views on certain particular subjects can be convened at a moment's notice.

It is sometimes necessary for a headmaster to issue an order to his staff, and it sometimes happens that this order is not understood by the staff and an explanation of it becomes necessary Such explanation must be verbal, and consequently a staff meeting is convened At such meetings the headmaster does the talking, explains the order issued, and answers any questions upon the subject, but the subject admits of no discussion.

There is a third type of staff meeting which perhaps is more valuable than any other, and that is a meeting amongst the staffs of different schools in a town—a kind of Teachers' Association. By means of such meetings the staff of any one school is prevented from getting into a groove, their outlook on school matters is broadened, they begin to see their own school through the eyes of other people, and they can pick up some extremely useful ideas which otherwise would not have occurred to them.

However, meetings can easily be overdone. A master who spends a full day in school and plays with the boys out of school as well can hardly be expected to yearn after staff meetings or Teachers' Associations, nor is a headmaster justified in piling work on to his staff and saturating them with

educational theories borrowed from German and American authors, who only know their own German and American boys and climate, and who cannot be expected to prescribe for India. A limit must be put to meetings and the best appears to be one a month, excluding the occasional meeting convened by a headmaster for some particular purpose.

The classification of pupils

One of the difficulties which beset the thorny path of the headmaster is the question of the classification and promotion of pupils The prevailing idea is that a pupil enters the first standard of a high school, and at the end of one complete year he passes the annual examination of the first standard and is promoted into the second, where he remains for one year and is duly examined and promoted to the third, and so on.

Then there are exceptional cases where a boy leaves the first standard of one school and after a few months' 'private study' applies for admission into the third standard of another school In all subjects, with the exception of English, such a boy is probably quite fit for admission into the third standard as the teaching of the vernacular schools is generally good If after a careful test in English the applicant is found to be up to the third standard there cannot be any objection to his admission, but the test must be thorough.

However, a headmaster must be very careful in his admissions and promotions or he will find his highest class absolutely unable to pass their final examinations It is mistaken kindness to promote a boy who is not quite fit for the standard above. It creates, to start with, a wrong impression in the mind of the boy, who finds he fails in his final examination although he has put in as much work as he could during his last year. He is very distressed, he blames his class-teacher and his school, and cannot lay his finger on the cause of his failure. The cause of his failure is undeserved promotion Again, it is mistaken policy because it hampers the teaching of the class-master, who finds that four-fifths of his class are fit for the standard and the remaining fifth are not, and should never have been promoted from the class below. A well-balanced class is essential if the teaching is to be effective; a master's duty lies with the majority of his class and he cannot afford to keep the brighter boys back to suit the pace of the dullards A headmaster's duty then is to be very strict in the matter of admissions and promotions, never to give a boy the benefit of the doubt, and to steel his heart against the appeals of boys, parents and guardians.

Examinations

The question of examinations is a vexed one both as regards the number necessary during the year and also as regards their scope At the conference of inspectors of the Bombay Presidency in 1913 four distinct opinions were expressed, and no very definite conclusion was reached. At any rate, it is obviously necessary to have some annual test or tests to decide the question of promotions Two systems are suggested here. The first is to have weekly examinations in one subject, that is, one week to have an examination in English, the next in Vernacular, the next in History and Geography, and the next in Mathematics The order is immaterial, but by this means most of the ground is covered in a month. This examination should be oral in the primary classes and written in the middle and upper, the questions being set by the respective class-masters. At the end of the year an annual examination should be held, in which the

classes should not have their examination papers set or their answers corrected by their own class-masters.

The main objection to this system is that boys, knowing that they are going to be examined at the end of the week in one particular subject, drop the other subjects and cram the subject for examination. The same objection might apply to the annual examination. Boys may do very little work during the first half of the year and cram a year's work into the second half.

The second system suggested is to hold no regular weekly examinations but, instead, three terminal examinations—say, one at the holiday time about October, one at Christmas, and a third before the hot-weather holidays, promotion to be based on the average marks obtained during these three examinations. This system is distinctly preferable to the former, as it encourages uniform work throughout the year. There should, of course, be frequent additional tests during the year in ordinary class-subjects and marks should be assigned for them and for practical work in Science, Handwork, etc., and the marks of these incidental tests and also of a boy's daily work, as revealed in his notebooks, should be taken into consideration in deciding doubtful cases. The first two terminal examinations might be set and marked by the class-teacher, and the third by other teachers

A rule should distinctly be laid down that a boy will get no marks if he is absent from any of these three examinations. A medical certificate should be accepted as grounds for absence from the first and second, but not from the third, because it includes questions on the whole year's work. A boy absent from the third terminal examination should have his name entered provisionally on the promotion list, but only if he has passed on the average of the first two terminal examinations, and at the beginning of the next session he should be subjected to a strict examination.

As regards promotion the following system is recommended: a boy fails (1) if he fails in English, (2) if he fails *badly* (i.e. if he gets less than 25 per cent of the possible marks) in any other subjects, (3) if he fails in any two subjects. It is advisable that some universal system should be adopted in all high schools, and that the matter should not be left to the discretion of headmasters.

The result of terminal examinations should be communicated to parents or guardians, in order to enlist their interest and co-operation. This report should show for each subject (1) the maximum marks, (2) the boy's marks, and (3) his place in the class. In some schools a 'progress-book' is sent monthly to the parents with the same object.

Now comes a point which masters are in the habit of forgetting in spite of its immense importance. The method of answering examination papers has to be taught just as much as any other ordinary subject. Masters are, as a rule, satisfied if their pupils show that they know a fair portion of the facts they have been taught, and think little of the way in which the examinees put their knowledge down on paper. This is the greatest possible mistake, and often means the difference between passing or failing in an examination.

All boys should be let into the secrets of an examiner's heart and should be told that he is but human after all, that when he has a pile of essays three feet high to correct his temper is not of the best, and that it only requires a

badly and untidily written first page of an essay to make the examiner fail a candidate, or at any rate feel inclined to do so. They should be taught then to write their examination papers tidily and to be careful of their spelling, if only to create a favourable impression. They should be taught to answer the question asked. It seems curious to have to mention such a thing, but Indian boys have a marvellous capacity for twisting a question round to suit the meaning they wish it to have. A case in point occurred a year or two ago when the essay set was, 'Describe a day in the life of a policeman.' The candidate did not know how the ordinary policeman spent his ordinary day, and so he described how his friend, who was a policeman, spent the second day of the Divali festival! Pupils should be taught to answer the question asked and *nothing else*. If an examiner asks the question, 'On what rivers are Paris, Rome, Lisbon?' the answer is to be given in three words, but a typical boy's answer would be. 'Paris is a town in France on the river Seine, which flows into the English Channel.' 'Rome is the capital of Italy, on the river Tiber. Horatius kept the bridge over the river Tiber.' 'Lisbon is the capital of Portugal. It is a place where there is bull-fighting. It is at the mouth of the river Tagus.' Such answers are very irritating to an examiner and a terrible waste of time. Boys should be taught to estimate in marks the value of each question and to answer the question to suit the estimated value They should also be taught to write their answers with their eyes on the clock, and if they have two essays to do in three hours not to take two hours and a quarter over one and three-quarters of an hour over the other. Not nearly enough is done in the schools to teach boys how to write examination papers, and the result is that when they appear for their public examinations they are really ill-prepared for them, though their knowledge of facts may be adequate.

Some doubt exists as to the advisability of having some form of mid-yearly promotion for the sake of boys who are specially gifted, but the number of such is so small that they need hardly be taken into consideration. A more practicable proposal might be to have a gradation scheme, irrespective of classes, for the upper school and a similar one for the lower, so that a boy who in ordinary general subjects is of average ability but above the average in, say, Mathematics, might gradually work his way up the mathematical ladder until he reaches the top, irrespective of where he is in other subjects. To make this proposal practicable the time-table would have to be arranged so that all mathematical work should fall in the same periods, and boys, irrespective of their classes in other subjects, would be drafted into the mathematical sets for which they are suited This system has actually been adopted in some schools in England and has a good deal to recommend it.

Time-tables

The adjustment of a time-table in a large school is a matter of very considerable difficulty, one of the difficulties being to distribute the work equally amongst the staff so that each does his fair share and has at least one period per diem free for the correction of written work There are other matters, though, of greater importance than this. One is that the subjects which require most brain-work should be taught at a time when the brains of the boys are most active. To set a boy down near the end of the school day to work out mathematical problems is useless. His brain is tired and incapable of the work. Such subjects as

Drawing, practical Science, Writing, etc , should, if possible, be reserved for the afternoon hours. The first two periods of the day should be given to the most difficult subjects. The second period is that in which a boy probably does his best work, as his initial inertia has been overcome by the end of the first period and the spirit of work pervades the school Variation in the subjects must be aimed at. thus, Geometry should not be followed by Algebra, nor English History by Indian History. The time-tables of class work must also, if possible, be arranged in conjunction with the home work time-table so that there may not be five subjects for the boys to prepare on one night and only two the next. In a bi-lingual school it is convenient to arrange for the two divisions of each class to be learning their respective vernaculars at the same time.

The length of the lesson periods is another difficulty. It is not a wise plan, though it is very convenient, to have the same length of period in all classes. The length should depend on (1) the age of the pupils, (2) whether the subject is practical or not, and (3) the length of the school day. In the lower classes lessons should not exceed thirty minutes and in the upper classes forty-five. It has been proved by experience that it is almost impossible for small boys to keep their attention fixed on one subject for more than half an hour, if that subject is not practical Practical Science and Hand-work lessons should last for one and a half hours, i e two ordinary periods, part of this time being taken up by the setting out of apparatus, tools, etc , and returning them at the end of the lesson

In the hot weather, when the school day is shorter than in the cold weather, the length, rather than the number, of periods should be reduced

If a subject is taught only twice or three times a week the periods should follow at intervals as nearly equal as possible.

The subjects taught and the ground to be covered are laid down by authority external to the school, but it remains for the headmaster to allot to the subjects periods of instruction each week in proportion to their difficulty or importance. In each classroom there should be a copy of the class time-table. In the headmaster's office there should be three time-tables, one to show the work of the whole school by classes (showing what any particular class is doing at any given time), a second to show the work of the school by masters (showing what any particular master is doing at any given time), and a third to show for each period of the week what teachers are 'free'. This last enables headmasters to make arrangements quickly for the work of absentee teachers.

Home work

The questions of the amount and the kind of home work to be done are debatable. To take the question of amount first, the general opinion seems to be that the younger boys who have worked hard in school and have also spent an hour or two in organized play have had a good day's schooling, and an hour's preparation should be ample for them. This applies to the three lowest classes. The middle classes can stand a little more home work and should be given enough to last them perhaps one and a half to two hours. The two highest classes should do two and a half hours' work at home—say, one hour at night and the rest in the early morning. The value of the early morning work far exceeds that of the night work. In fact, the less work done at night the better ; if boys

have been working and playing as hard as they can during the day they will be too tired to do effective work in the evening

Secondly, with regard to the kind of home work set, the following points should be taken into consideration :—

1. Home work should not be a mental strain on the average boy of the class, and should leave him sufficient time for recreation, general reading, and any hobbies he may happen to possess.
2. As a rule home work should not be set in more than four subjects daily. The headmaster will perhaps find it necessary to direct his masters as to the amount—a point referred to later.
3. Home work should be of a kind that the pupil himself can undertake without assistance from a private tutor.
4. At the same time it should not be purely mechanical, e g. the copying-out of notes given in class.
5. In the lower classes home work should be largely revision of work already done in school. In the higher classes students may be allowed to break new ground for themselves in the way of preparing a lesson in English text, History, or Geography.
6. Home work, once set, must be rigidly exacted. It must therefore be definite in amount, and should be such that 'copying' should be impossible, or at any rate difficult.
7. As little writing work as possible should be set for home work.

The amount of home work set for each class must be adjusted between the various teachers of that class. It is surprising how jealous masters are in this respect, each one imagining his own particular subject to be by far the most important of all, and it is sometimes necessary for the headmaster to adjudicate in the matter.

The home work time-table should be posted up in the classroom, and the head boy of the class should see daily that the home work has been set. In order to secure the co-operation of the parents still further, a copy of the home work time-table, and one of the class work time-tables as well, might be sent to parents with advantage, and they might be requested to see that the home work set is properly completed.

Parental co-operation

Owing probably to the fact that many of the parents of the present generation of schoolboys are either uneducated or only semi-educated, the difficulty of securing parental co-operation is very great. Of course, each year this difficulty decreases and in proportion to the decrease the effectiveness of the schools will increase At present in the best of schools we find the headmaster, the staff, and the boys pulling in one direction, and a large number of parents pulling in the other. Unless all four are pulling in the same direction the work of the school is hampered severely and its effectiveness is impaired Scotland is probably the country where parental co-operation has been brought to the highest pitch. The parents there cannot do enough for the school in which their children are being educated or for the masters educating them. In India the exact opposite is often the case. Some parents, beyond providing the money for their sons' education and a room in which they can study and sleep, do very little to help the children and nothing to help the school or the masters. In fact, in many cases they hinder the work of the school, criticize

it unjustly, and put stumbling blocks in the way of the headmaster and his assistants. It is not entirely the fault of individual parents : it is the fault of their dogged, deep-rooted conservatism. Times are marching at present too rapidly for them. They have for years been accustomed to having Rama to do their shopping for them at market on Saturdays. Now the headmaster wishes Rama to attend school instead: How unreasonable ! Games have been started in the afternoons, when Rama used to do his home work, stewing over his books, breathing vitiated bazaar air and otherwise trying to bring his life to an untimely end. Now Rama has to play games and do his home work at night or in the early morning, upsetting the household arrangements. What a nuisance ! Some parents cannot understand that a headmaster is not nourishing any private animosity against them, but is only endeavouring to do his utmost for the good of the boys entrusted to his care, according to the latest ideas of sound education. They often merely regard the headmaster as a sort of crank, full of new-fangled ideas, calculated to annoy parents though of course not introduced with that object, and they refuse to see that their sons are becoming brighter and healthier than ever they were themselves, or, if they see it, they do not stop to think out the reason.

It is needless to say that there are many other parents who are extremely anxious to see their sons well educated and are of great assistance to the schools, but the point is, so long as there are any parents of the kind suggested above, the perfect working of a school is thrown slightly out of gear.

How can a parent help a headmaster ? First of all, he can see that his son is absolutely regular in attending school every day and all day. Many boys in all schools attend the morning periods and not the afternoon, because their father wishes them to do some ' private business ' ! What ' private business ' is there of such importance that it should stand in the way of the boy's education ?

Secondly, a parent should see that his son arrives at school on the first day of term instead of a week late. Every parent on the last day of a term knows the exact date of the re-opening of the school and should make his holiday arrangements accordingly.

Thirdly, a parent should recognize that it is far more important for a boy to spend ten days in school than to attend the wedding ceremonies of a distant cousin and to overeat himself there, and that a pilgrimage can be performed during the school holidays just as well as during term-time.

Fourthly, a parent should try to understand the advanced system of modern education and to see that the character and the health of his son are matters to be taken into consideration, and should help the headmaster by insisting upon his son's attendance at games and the other school activities which are being gradually introduced into Indian schools.

Fifthly, a parent should see that his son avoids bad companions and the various baneful influences of the bazaar. The staff of a school do not pretend to make themselves responsible for boys when they have left the school premises, although nowadays a good deal is being done in that direction too. The Government is planting hostels all over India so that boys may not be exposed to the dangers and temptations of bazaar life.

Sixthly, a parent can actually supplement the teaching of the master when the boy is doing his home work.

Lastly, by speaking highly of the school to others, by discussing his son's education with the headmaster and his assistants, and by generally advancing the interests of the school, a parent can give immense help and encouragement to the schoo staff.

A headmaster has to secure the co-operation of the parents by hook or by crook, and it is no easy achievement to do so. Appeals to parents to come and visit the school and talk about their son's education generally prove unsuccessful. Probably the surest way, if not the only way, is through the boys. To secure the co-operation of the boys various qualities are necessary in a master. The qualities that most appeal to boys are justice, firmness, accessibility, courtesy, sympathy, and dignity. If a master fails in any of these qualities on any occasion he has taken a step back, and ground lost is difficult to recover. If a headmaster or an assistant shows any kind of favouritism, is in any way stand-offish, impolite, undignified, or unsympathetic, he is not in touch with his school boys or, through them, with the parents. A headmaster must also take the boys into his confidence. Boys are reasonable beings. They like to have things explained to them A new order is issued in a school: for example, that all boys are to be weighed. The bad master merely tells his class to go and get weighed. They go, like a flock of sheep. The good master explains exactly why they have to be weighed. The boys report the matter at home and give the reasons, and the parents are interested and begin to believe that there may be something in the care of the body after all. No amount of letters to parents will produce the same effect. The boys are the medium between the school authorities and the parents, and so it is essential to secure their co-operation and the co-operation of the parents will follow in due course. It is unfortunately often necessary for a headmaster to tell a parent some home-truths, and then another quality comes into play, and that is ' tact '. Happy is the man possessed of this gift! He can tell a parent many unpleasant things without giving offence, and the parent will leave his office with a higher opinion of the school and staff than when he arrived. A perfectly quiet, cool and collected demeanour will calm a parent where any attempt at bluster or a dictatorial bearing on the part of the headmaster would make matters worse and do the school irreparable harm. It is the duty of a headmaster to uphold the dignity of his office, and, after all, education is the subject in which he has specialized, and so he is probably in the right; but if a parent can prove that he is wrong, the tactful headmaster concedes the point and shows that he is glad to have had his mistake pointed out and every one is pleased. Even a schoolmaster is not infallible.

As long, then, as masters know that the co-operation of parents is essential and do everything in their power to secure it, and as long as parents recognize that they must help their sons, the masters, and the school as far as they can, if they wish their sons' education to be thorough and useful, all will come out right in the end, but the lack of parental co-operation at present in India is one of a master's greatest stumbling-blocks.

Corporate life

A boy in his earliest days, when he first begins to take notice of things, is inspired with a deep love for his parents and his home. Later on he begins to love the street in which his home is situated, and the town in which he lives, and so on in ever-widening circles. When he goes to school he goes to a second home and the same feelings should

arise in his heart. He should love his class and the school, of which his class forms a part. Naturally and rightly his love for and pride in his first home should be the greater, but that for his second should not be far behind. The love of home amongst Indians is almost proverbial. It impregnates their whole life, and it would be well if such love could also be directed towards their school; for is not their school their second home? are not the masters their second parents, and their class-mates their brothers? They should be, if the tone of the school is to be the proper tone. Boys should remember that upon each member of a class hangs the honour of that class, and upon the honour of each class hangs the honour of their school. Each class is a family, and the members of that family are interdependent. If a single member of that family does a disgraceful deed, the whole family's honour is besmirched, and the shield of that class is tarnished. So also, to adopt another metaphor, each class is an important part of the school engine. If any part of this engine is out of order the whole mechanism is thrown out of gear. This is not a difficult lesson for boys to learn, but they will not learn it unless it is put before them and explained to them, and when they see the reason of it they have learnt the lesson of corporate life of *esprit de corps*. In England and other countries this spirit is fostered by the 'house system', where the credit of a boy's own house is what each boy fights for, not only in inter-house athletic competitions but also in the classrooms. In smaller schools where the house system does not exist, there is keen rivalry between tutors' 'sets' or between boarders and day-scholars. In India very likely an equally keen rivalry will soon exist between day-scholars and hostel-students, and the value of such rivalry, as long as no bad spirit or jealousy is shown, cannot easily be over-estimated. The more the ways in which such rivalry is exhibited, the healthier is the tone of the school and the more alive is the spirit of corporate life. If there is no competition in a class the work of that class is dead. A spirit of perpetual competition between members of one class, between different classes in a school or different sections of that school, between one school and another school, must constantly be encouraged as a perpetual stimulus to the boys and masters.

The hostel

One of the most modern and the most important developments in the educational system of India is the hostel. The surroundings in which schoolboys are obliged to live and work when away from the school premises are more often than not very undesirable. Many boys have no homes in the town and have to hire a room or a part of a room to sleep in, and to find their meals in an hotel. The hotel is probably very dirty, and the meals badly cooked and at inconvenient hours. The company at meal-times also is often none of the best. Such a state of things does not give a boy a chance either of doing his work satisfactorily or of living a clean and blameless life. Such a chance now is offered in the school hostels, and it is necessary to observe that hostels are for those who are living under the conditions described above and not for those who have comfortable homes to live in and parents to look after them.

One of the dangers of a hostel is that those very evils, to avoid which hostels have been built, may be allowed to creep in through want of careful supervision. The evils may be mentioned a second time: dirtiness, badly-cooked meals, irregularity of meals, and evil companionship. It is the duty

of a hostel superintendent to see that the rooms and passages are kept scrupulously clean. Windows, doors, ventilators should be kept open as far as possible, so that sunlight and air may be admitted freely. The drainage of the compound has to be seen to, so that after rain no pools of water may be left standing about, to serve as breeding-places for mosquitoes, and bath-water should be carried off by drains. Latrines, urinals and kitchens should be inspected constantly and disinfectants used freely.

It is a good plan for some of the senior students to be responsible for the cooking of meals and the buying of foodstuffs, but naturally they should be under the general supervision of the superintendent, who should frequently visit the dining-hall during meals and hear and inquire into any complaint that may be made. He should also arrange the times at which all meals must be ready and see that they *are* ready at those times

Then comes the question of companionship—the most important and most difficult of all. 'A little leaven leaveneth the whole lump.' If this leaven is bad, its effects spread rapidly through the whole hostel. If once a bad boy is admitted into a hostel the evil effects of his society will soon make themselves felt and they will be terribly hard to eradicate. So the most scrupulous care must be taken in the admission of candidates, and a superintendent is justified in refusing admission to any boy of whom he has the slightest doubt. No risks should ever be run, because the superintendent accepts responsibility not only for the studies and health of the boys under his charge, but also for their character.

Another way in which bad companionship may be introduced into a hostel is by allowing the friends of hostel students to visit the hostel and perhaps stay a day or two there. There is no occasion for such friends ever to be admitted to the hostel buildings, nor should any one, parent, guardian, or friend, ever be allowed to spend the night there. There are in every town places where such visitors can pass the night, and a superintendent has no reason to incur any risks Nor should hostel students be allowed to spend a night away from the hostel except on very special occasions, and only then when the parent accepts every responsibility. The Indian custom of constant visits between relatives and friends, though a pleasing one in itself, has to be combated when it involves school-going boys These visits do no good, and only serve to take a boy's mind off the purpose for which he is at school A hostel presents the best example of corporate life possible in India. Boys begin to learn how much their hostel and their school mean to them, what help their companions are, how their hostel-world is only the great outside world in miniature. They begin to love their school hours, their games hours, and the hours which they have to themselves. It is a part of a superintendent's duty to see that these odd hours are occupied with reasonable amusements, and indoor games and a library with illustrated papers and magazines should be provided.

If a hostel is properly managed, in time the students will never wish to leave the premises, and their desire to go to the bazaar and stroll about the dirty, dusty streets and look into the dirty, dusty shops will die a natural death. As long as this desire remains, there must be something wrong with the hostel.

A hostel must be under the charge of a properly qualified medical

practitioner, who should call once a day; and if any student is reported sick he should be examined and the orders of the doctor attended to and carried out exactly. In this connexion too, it would be well if all students at the beginning of each term were to bring a written notification to the effect that they have not suffered from or been in contact with any infectious or contagious disease during the three weeks prior to the beginning of a term, so that the hostel may start each term with a clean bill of health.

There is one other way in which the character of a hostel can be guarded. Unfortunately, in all schools in all countries theft is not uncommon. To minimize the chances of theft it is advisable for students to deposit their money and valuables with the superintendent, who should act as their banker and teach them, incidentally, the value of thrift and encourage them in the virtue of economy.

Games

It is unnecessary to say much about this subject as the value of games is now generally recognized, not only because they improve the health and stamina of schoolboys but because they play an important part in the formation of character. A boy who has learned to play a game for the sake of his side instead of for his own sake has learned a very important lesson, and a lesson that can be learnt in no other way. By playing games he will also learn how to lose, which is as important to him as learning how to win. There is one aspect of games which is not so universally recognized. In the playing-field a master learns more of his pupils' character than he does in the classroom, and without a knowledge of his pupils' characters his teaching will be ineffective, and the various punishments he inflicts will probably be unsuitable.

Games must be properly organized and properly taught. The rules must be learned, of course; but, above all, the proper spirit must be cultivated. It would be far better to play no games at all than to play them in the wrong spirit, and, shameful though it is to say it, the wrong spirit is sometimes in evidence at present. Unpleasantness often occurs from ignorance of the rules on the part either of players or umpires. The rules of all English games are extremely intricate, and only those who have played them from their youth up are likely to know all the rules, and even they often make mistakes It also often occurs from thoughtlessness or from an overpowering desire to win at all costs. It unfortunately sometimes occurs from a deliberate intention to play unfairly. The spirit of sportsmanship is of slow growth.

The boys of India as a whole are not proficient in athletic sports. The climate is not quite suitable, for one thing, and the prevalent idea that such things as jumping, running, etc., require little practice militates against any successful performances. However, athletic sports are of great value, and boys in India will soon come to learn what fine athletes there are amongst them and will begin to practise. Wrestling too should be encouraged. It is a manly sport, and one in which Indians as a whole are proficient.

To conclude, the superintendent of a hostel has before him a great opportunity, if he will only seize it. He has his boys ready to hand, and can turn them out on to the playground whenever a suitable time presents itself. and train them in games and sports until they can hold their own

against all the rest of the school put together; and such an opportunity should not be lost.

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CHAPTER 3

CLASS-TEACHING: ITS PRINCIPLES AND PRACTICE

Until the complex activity we call teaching has been broken up into various simpler activities, it is difficult to locate deficiencies which the teacher can correct with a reasonable amount of concentrated practice. One thing at a time is the rule for improvement in teaching as for improvement in other skills which are equally complex. Some of the more obvious factors in successful high school teaching are accordingly treated here as somewhat separate units. But this distinction between various teaching procedures is, of course, more apparent than real.

Distinction between successful and unsuccessful teaching

Learning to teach successfully is like learning to drive a car, learning to play bridge or golf, or learning any other complicated performance, in that the learner must develop skill in several different operations all at once. To secure a driver's licence, for example, it is not enough for the novice to be able to start the motor, regulate spark and gas, steer the car, and change gears, by performing each operation separately. He must be able to combine these and other operations properly, and perform them at the same time or in their proper sequence before he is qualified to drive. In much the same way, the teacher's success depends upon the *combining* of various operations, each of which is best learnt when practised separately. But before he singles out any one of these operations for special practice, the teacher should recognize the *fundamental distinction* between successful and unsuccessful teaching sufficiently to know when all operations are working in proper combination. That is, he should know good teaching when he sees it The teacher should then analyse his job sufficiently to discover how each important operation makes for success in the total performance, and how it is related to other operations.

The fundamental distinction between successful and unsuccessful teaching lies in the amount and value of learning that is stimulated in the pupils. This commonplace remark would be quite superfluous were it not so easy to find high school 'teachers' who are satisfied to go through the motions of teaching without any clear notion of what they are trying to do. It is as though it were argued, 'The teacher often makes an assignment, comments on it the next day in class, asks the pupils certain questions to discover how well they have done it, and gives a mark. Therefore if I do these things, I must be teaching.' The fallacy consists in giving two very different meanings to the word 'teaching', of which only one is legitimate. Teaching does not mean 'performing the operations which teachers perform'. It means 'getting pupils to learn' and nothing else. When considered apart from their effects on the pupil's learning, a teacher's activities are as entirely meaningless as those of a tennis player when the spectator cannot see his opponent in the opposite court! These activities acquire meaning only when the pupil's reactions to them are known. The successful teacher studies his problem, formulates his aims, selects his

procedures, combines them, and carries them out primarily in terms of the observed effect upon the pupils taught. The unsuccessful teacher usually takes these effects for granted. Herein lies the distinction.

Previous preparation necessary

The best teachers never reach the point where preparation for the day's work is unnecessary. Even when a teacher has taught a most successful lesson, it is dangerous to try to repeat it in precisely the same way. The two situations will not be similar. The subject matter which should be drawn upon for any lesson constantly changes. Besides, no two groups of children have had exactly the same varieties of experience. Hence the need for varying the approach and for making previous preparations every time. Old work is also thus kept from getting monotonous.

Lesson planning includes

It is recognized by the best teachers that it is not safe to depend upon the inspiration of the moment for good questions, illustrations and illustrative material, and references to books or magazines. Therefore it is necessary to have a form or outline showing how teaching procedure is to be related to subject matter. It is also desirable to have some idea of the amount of time that may be given to any particular part of a lesson.

In the preparation of a lesson plan, the following elements are essential

1. Mastery of material

The first and in some respects the most important step is to become thoroughly acquainted with the material which bears upon the topic to be treated

2. Appropriate organization

After the teacher has in hand an abundance of interesting material, the next step is to organize the data to be presented. This organization depends on the problem to be solved by the children. Hence the necessity for discovering a problem to the pupils which can be satisfied by the subject matter to be presented. The difficulty with the ready-made organization found in most textbooks is that it has little or no relation to the needs or problems of the particular group of children. A felt need is the beginning of all knowledge. This is precisely the difference between the logical and psychological methods of presenting subject matter. Not that the psychological is illogical; rather it takes account of the child's needs, and is for him logical beyond the most logical scheme. In organization then, the starting point is to get the child's point of view, to discover his problems, and to arrange the material to be presented with reference to the child's aims. In satisfying children's problems, much of the information which might have been imparted had the adult scientific order been followed, will be mastered by the pupils. Much more will be remembered because the information is associated with the solution of interesting problems.

3. Arrangement of topics

Good organization demands that this material be grouped around a few co-ordinate heads. Many topics of equal value in an outline generally indicate a lack of appreciation of the relation of the various facts to be presented. In any scheme of outlining a more or less arbitrary set of symbols is used to indicate co-ordination, while the fact of subordination is shown both by a change from one series of symbols to another, and by the equal indentation of each successive subordinate series.

A good lesson plan will include pivotal questions which will serve to call for the data as indicated by the main topics. A question or two which will discover to the children the problem to be solved should come first. The careful preparation of a few questions will enable the teacher to prevent children from wandering in thought during the development of the topic. Thought-provoking questions which will guide and stimulate children in the solution of their problems are dependent upon the aim which has been established, and upon the organization of material which it is desired to follow in the solution of the problem.

4. Pivotal questions

Lessons often fail because the ground covered during the period cannot be retraced by the children at the end of the exercise. In a well organized plan, the teacher will provide for summaries as each main topic is finished. The skilful teacher puts his question, which involves a summary, in such form that the pupils get a new view of the ground already covered.

5. Summaries

A good plan will include a list of illustrations, illustrative material, books including references to chapter or page, and maps or charts which are to be consulted during the period. This will save time and conserve interest. Dramatization, constructive work, graphic representation at the seat or on the blackboard, may make the difference between success and failure in a recitation.

6. Illustrations and other aids

A well-planned lesson will naturally end in the assignment of work to be done in preparation for the next period. Children need definite problems more when working by themselves at home than when with the teacher. A good lesson makes provision for definite progress and makes clear the question yet unsolved. An assignment of the usual kind which gives merely the limits of work (from page . . . to page . . .) is hardly satisfactory. Pupils should be told how as well as what to do. It should inspire pupils with a desire to perform the task given. The assignment must suit the needs and standards of the class quantitatively and qualitatively. Individual differences can be met by providing 'maximal' and 'minimal' assignments. More time will be given to this aspect of class work if the assignment is recognized as a definite phase of instruction. In passing, it may be mentioned that the assignment should be attempted only when sufficient interest has been roused, and when an unhurried and undisturbed statement of the new task is possible.

7. Assignment

We must now take up the specific form that is desirable for the daily notes of lesson or lesson plan. Experience recommends a double column scheme in which the organization of subject matter is usually made in the left hand column, and the parallel analysis or suggestion as to method of procedure and devices are stated in the right hand column. While some rigid Herbatians would seek to force every lesson into a definite mould and make it conform to the 'Formal Steps of Method'—(1) Preparation, (2) Presentation, (3) Comparison, (4) Generalization and (5) Application—it is obvious that in the interests of spontaneity and freedom such an attempt is not to be encouraged. There is much that is of value in that analysis of the process of the acquisition of knowledge, but formal schemes of method usually tend to mechanize instruction. Reference will later be made to Herbart's influence on Method.

Form of notes of lessons

The general attitude of the teacher in making daily lesson plans, as far as the question of form is concerned, may be summarized by saying that the plan should be systematic, but it should also be elastic.

Brief reference has already been made to certain desirable types of questions. By a conscious process of 'good questioning,' an intelligent teacher can lead his educational traveller through unfamiliar regions to a desired destination. The right question is the psychological basis for all learning It is certainly the best means of stimulating thought. A teacher's skill can be measured by the way he handles this most important pedagogical instrument.

Types of questions:

There are various types of questions. Fact questions are employed to tap the informational resources of the pupil, and usually begin with 'what' and 'when'. Thought questions, beginning with 'why' and 'how', are meant to provoke more serious mental effort. Questions demanding topical answers are greatly to be encouraged. Developmental questions are helpful when a certain line of thinking is the goal. Skilled questioning is based upon a reasoned sequence prescribed by the nature of the subject matter. Obviously sequence is less apparent in the specific questions of a drill lesson.

Desirable

Teachers' questions should be clear, concise and definite. Only one interpretation should be possible. The question should be framed so as best to accomplish the purpose intended, whether it be to emphasize a point, to test the pupil's information, or to stimulate the pupil's thinking. As a rule it should be addressed to the entire class before any one pupil is called on for reply. Questions should be distributed over the whole class, but no predictable order should be followed.

Because they occasion little thought, direct, leading, alternating, elliptical and all obvious questions ought to be avoided. 'Is it wrong to smoke cigarettes?' (Direct); 'It's wrong, isn't it?' (Leading); 'It is right or wrong?' (Alternating); 'To smoke is injurious to the . . .?' (Elliptical),—illustrate these forms, which are more often heard in humdrum or hurried teaching than one who has not watched in many schoolrooms may suppose. Further, it should not be forgotten that a hurried tone, or a manner and inflection indicating doubt or defiance of a pupil's ability, exert a negative influence. It is very much easier to discourage pupils than most teachers realize.

Undesirable

The very common practice of repeating pupil's answers contributes to the monotony of a voice inevitably heard too often, and dulls responsibility on the part of the pupils for clear utterance and careful attention. Indefinite and slipshod answers should not be accepted Teachers are guilty when they prompt unduly or say, 'That's all right, I know what you mean,' after every lame attempt of an unprepared pupil. Unless a pupil is evidently on the wrong track he should be allowed to complete his answer uninterrupted Students should be made to realize the necessity of being heard by all the rest, and to get into the habit of addressing the whole class. It requires special tact on the part of the teacher to prevent digression caused by irrelevant responses.

Answers

It is advisable at the very outset to have a definite understanding regarding the approved manner of answering questions, in order to save confusion and

irritation. The establishment of conventions is a very desirable thing in this matter. Students should be drilled in the proper methods of answering in written as well as oral examinations. For example, in describing such events as the French Revolution or the American War of Independence, it ought to be understoood that they should give its cause, course and consequence. In making a character sketch, it is well for students to get into the habit of dealing with the two sides of a man's character, public and private, and also with the qualities of head and heart. Ignorance of such simple matters is responsible for many examination tragedies Students have a right to be taught this technique.

Illustrations and illustrative material

Teacher and children are often disappointed during a recitation lesson because of the lack of illustrative materials which could have been at hand had the teacher only thought about the lesson before teaching it. Excursions and field trips, taking the class to the object of interest, specimens brought to the classroom, the use of pictures, graphs, maps and globes, charts and diagrams, experiments and illustrative stories, all need serious consideration by the teacher who would master the technique of their use. Too generally these are incidents not regarded as essential nor depended upon to perform any specific function. Visual instruction, through lantern slides and moving pictures, can perform invaluable service if properly conducted.

To teach skilfully, one must have and use a fund of illustrations and illustrative devices. The vagueness and unreality of much that is taught in school is often due to the lack of illuminating and vivifying illustrations. It is better to use too many than too few. Pupils as well as teachers should be expected to illustrate their contribution. If a teacher endeavours to make clear his remarks by the use of the blackboard, why should not the pupil? Further, illustrations must be brought into relation with the lesson which is being presented. If the illustration is exceedingly interesting or is continued for a long time, the class and sometimes the teacher lose sight of what is being done. Again, what is being employed in explaining should not itself need explaining An abuse of illustrative material is the common device of using 'illustration' merely to hold attention, even by mere amusement. This is particularly true of stories, but stories can and should be used to great advantage. Personal illustrations must be used cautiously and judiciously.

The blackboard

As a rule teachers do not seem to realize the tremendous part that the blackboard can play in the process of teaching and learning. It is often tolerated merely as an unavoidable article of school furniture. Assignments given to the class are rendered more definite and unambiguous by being put on the board. Brief running outlines of the lesson help to fix the relation of the different parts to each other. New words or expressions written in bold letters are most easily learnt Neither too much nor too little should be put on the board, but just enough for the purpose. A blackboard summary may well form part of the notes for the lesson. Further, it is usually forgotten that blackboard space can be turned to fuller account by using it for semi-permanent material to be learned casually. No teacher can be excused for shabby or careless writing, for it is likely to be a lesson in slovenliness to the pupils. What is worth writing, is worth writing well. Remnants of old or other lessons should not be visible

anywhere. It is best to make different students in turn responsible for keeping the board clean at the beginning of the period. The inexperienced teacher should learn to write neatly, legibly and economically. Practice is the secret of success.

Proper use of textbooks

Another useful ally of the teacher is the textbook. Though it is liable to grave abuse, still the meagre educational qualifications of some teachers renders its presence indispensable. The type of teacher who looks up to the usual textbook as a complete and final authority does not make a great success of textbook teaching, but it is appalling to consider what he might do with no textbook to lean upon. When all the teachers are well trained in the content and method of their subjects, there will be less exclusive dependence upon textbooks and more teaching of subjects. The movement abroad is toward the increasing use of supplementary and reference material and of many books instead of one. The sources from which data can be gathered are almost without number, and any wideawake teacher can provide for the enrichment of the textbook. The chief difficulty is that so many teachers are acquainted only with textbooks—sometimes with but one in each subject—and so possess little background Worse than these are teachers who, because of inadequate preparation, are ignorant of what is contained even in the textbook lesson which they have expected the pupils to master.

Pupils should be taught the proper use of textbooks. The ability in adult life, to judge the value and scope of a book is one of the most valuable bits of technique that the schools can teach, and one that is not commonly taught. Review or revision done with reference to a 'Table of Contents' which has been made a centre of associations, can be managed later without a complete re-reading of all the text. Pupils should also be taught how to use the alphabetical index and also encouraged to use it. It would not be unwise to advise that teachers should develop in pupils a challenging attitude in their approach to print. The most hurried, fantastic, and inaccurate yarns of the newspaper reporter are taken for truth by a great majority of readers. A printed page is a fetish for most; they reverence it as inspired. Efforts should be made to see that the textbook does not hamper independent thinking. Collateral reading suggests one way of escape.

Examinations: defective

The success or failure of the teacher in applying the principles which have been discussed in the preceding pages is measured by the achievements of the children. And yet the traditional types of examinations are open to much criticism. In the first place they are unreliable from the standpoint of discovering the deficiencies of pupils and their achievements. Another difficulty with the ordinary examination is the variability among teachers in marking papers. Further, there is the tendency among examiners to derive their standards of achievement from the group itself, rather than from any objective standard by which all are measured. Besides all this, they are laborious and time-consuming.

but necessary

And yet examinations are indispensable. The only proof that we can get of the success or failure of our work is through these periodical tests. Thus we discover the progress which is being made from week to week, month to month and year to year.

The public demands the evaluation of the abilities and achievements of the pupils. Parents, employers, and each advancing step of the educational system itself, demand accurate grading. The work of the pupils aids the headmaster and the inspector in the evaluation of the success of the teacher. We may question the value of the traditional types of examination, but we cannot deny the necessity of having some method of evaluation.

New types of tests

Fortunately for us, we do not have to content ourselves with merely pointing out the evils of the present examination system. A variety of devices have been evolved by the example and inspiration of the standardized test movement which may well displace the old conventional 'discussions' or loose general questions. The following examples of the new examination are given to make this point clear and to show its superior advantages. A much clearer and fuller treatment of this matter can be found in Stornzand's *Progressive Methods of Teaching*.

Enumeration tests: e g. State four objections, from an educational point of view, to the old discussion type of examination.

Completion tests: e.g The devices described here are useful for . . . as well as testing.

True-false or 'right' and 'wrong' or 'Yes' and 'No' tests. Write 'True' or 'False' in the margin against each of the following statements, e.g. The True-False tests are absolutely objective and impartial.

Association tests are those in which pupils are asked to connect each of the topics in one column with the topic in another column that they think most closely related to it, e g. 'dates—events', 'men—movements', 'cause—effect', 'region—product', etc.

Reasoning tests are most difficult to make. They consist in the common-sense selection of the right reason for a situation from a list of several alternatives.

There are certain possible objections to the use of these new type tests. It is alleged that they emphasize unduly the memory element. This can be offset by a generous amount of reasoning tests. Some say that they provide no place for the expression of one's language ability, but is the testing period to test, or to give students practice in essay writing? There is no doubt that the preparation of the test will consume much time, but it must not be forgotten that the valuation can be done at a much quicker rate. The danger of dishonesty and copying can be met by proper seating and other arrangements.

Their advantages

On the other hand there are many weighty advantages. These tests are much more objective than the discussion-examination, and can be marked much more impartially and uniformly. More ground can be covered in a twenty-minute test than in an hour of written discussion-testing. There is a pointedness to the responses called for that makes it impossible to evade. Besides, they have diagnostic value and make experimentation possible. A final use of the tests is as study-guides, for the questions cover the important elements to be specially studied and learned.

For these reasons, progressive institutions abroad have begun to use the new type of examinations in most classes in the high school and college

and in the university. They find that the tests are really effective and serve the purpose more economically. Examinations we must have, but not of the traditional type. Any teacher trying the new type once is bound to become an enthusiast. It is to be hoped that in India also this type will be introduced for use not merely in class examinations but also in public examinations. Until then it cannot be said that examinations are examining in what they are supposed to examine or that the results are not vitiated by a number of extraneous factors and considerations.

Habit-formation

The more of the details of our daily life we can hand over to the 'effortless custody of automatism' the more our powers are set free for other work. The purpose of habit is to render voluntary effort unnecessary in a multitude of relations, thus freeing the mind for situations which cannot become habitual. The value therefore to the teacher of the laws of habit-formation is tremendous. Both in classroom management and in everyday instruction he will notice the force of habits, both good and bad. It is of the utmost importance that none but the proper responses should be reduced to the automatic level. Manuals of psychology deal with the subject at such great length, that only its special bearing on educational matters need be dealt with here.

Two laws: 1. Law of exercise

The two great laws of the formation of habit are the laws of exercise and effect. These laws apply in all cases of habit-formation, whether they be the purposeless habits of children or the purposive habits of maturity. The Law of Exercise says that the oftener and the more emphatically a certain response is connected with a certain situation, the more likely is it to be made to that situation. The two factors repetition and intensity are involved. Drill is the usual method. It is because of the recognition of the value of repetition that the old maxim of 'practice makes perfect' has been so blindly followed. That practice may also make imperfect is often forgotten. A child becomes more and more proficient in bad writing or position, incorrect work in arithmetic and spelling, with practice just as truly as under other conditions he improved in the same activities. To get perfect results the repetition must be only of the right forms, e.g. of spelling and pronunciation. The amount of repetition necessary for the formation of any given habit varies with the habit and with the individual.

Attention necessary

Focalization of consciousness upon what must become habit is very important. In certain types of habits, however, where incidental learning plays a large part, many skills may be acquired without concentrated attention. Much of the learning of little children is the result of suggestion and imitation. The absence of clear apprehension, and motive for effort, often results in incompleted skills and occasionally in incorrect responses. The problem then becomes one of making the pupil want to care, or to give attention to the details. Motive for practice is at its best when the pupil feels direct need of the activity which has been isolated for drill; he most willingly attends to what is seen to be worth while. Strictly speaking, repetition without attention is hardly possible, but the mind may be centred upon some other element. The teacher who requires a pupil to copy a word ten times in order to fix its correct spelling, cannot be sure that the attention is primarily upon letter

sequence, sound of the word or syllabication; it may be upon a peculiar flourish which is given to the penmanship!

Further, every element to be mastered must be given practice. Many teachers ignore the specific nature of habit in expecting practice to result in general improvement. 'Improve your writing' and 'practise pronouncing your words more clearly' are common examples of such expectation

Distributed repetition

After the plane of habit has been attained, opportunity for occasional repetition should be given at intervals which may be gradually lengthened. Such distributed repetition will result in greater retention and more certain recall. It may be mentioned also that drill is rendered more effective if appeal is made through more than one sense.

2. Law of effect

The second great law is the Law of Effect. It says that any connexion whose activity is accompanied by or followed by satisfaction tends thereby to be strengthened. The law that satisfaction stamps connexions home, and annoyance inhibits connexions, is one of the greatest laws of human life. We learn that which gives us some kind of pleasure. It may be occasioned by a reward, or recognition from without, or by appreciation arising from self-criticism. The law of effect must work as well as the law of exercise, if the results are to be satisfactory

In this connexion two suggestions may be made. The character of the first responses made in any given situation has great influence on all succeeding responses. They make the strongest impression and are the hardest to eradicate. Hence particular care needs to be taken regarding the first efforts of children in any particular field. The first few weeks in a subject have a great influence on all subsequent responses

The next suggestion is that exceptions should never be allowed to occur. Not only will the occurrence of one exception make more likely its recurrence, but if the exception does not recur, at least the response is less sure and less accurate than it would be otherwise. Sometimes even one exception undoes the work of weeks and months. This is especially true in breaking a bad habit, or in forming a new one which has some instinctive response working against it. The acceptance of this fact will also mean the necessity to secure uniformly correct responses in writing, spelling, pronunciation, use of idioms and phrases, in classroom routine and school discipline.

Teaching how to study

One of the most deplorable facts regarding the work of the school is the failure to teach pupils how to study. While it is certain that studying is one of the unavoidable activities of the pupils all through their academic career, yet few institutions make it a point to put children in possession of the appropriate technique. The proficiency of each student will be increased by teaching him to use more skilfully the ability which he has. In life information is gained largely through individual effort. We therefore cannot stress too heavily the value of correct methods of attacking and disposing of problem-situations as they occur. The indifference shown hitherto to this most worthwhile and indispensable acquisition, is one of the most astonishing facts regarding our schools and colleges.

Reference has already been made to the proper use of the textbook. Use of indices, statistical tables, maps, glossaries, footnotes and paragraph

headings, underlining, summarizing, etc., ability to select and reject material in the light of a particular need, ability to use with economy of time more than one reference book on a particular subject—all of these and many other useful habits should be begun and raised to a considerable degree in the high school.

As has already been suggested, a definite problem serves as a goal toward which to work, and a criterion for finding the relative value of material and method. From the beginning children must be taught to make sure that they know what they are going to do or look for, before starting to study. Better no study at all than aimless or misdirected activity.

The demands of economy require that the topic of study receives concentrated attention. Half an hour of concentrated work gives better results than an hour of study with scattered attention. An hour spent when half an hour would do is thus not only wasteful of time, but is productive of poorer results and bad habits of study as well. Students should be encouraged to set themselves time limits in various subjects, and adhere to such a schedule. They should avoid doing their study under conditions of worry, distraction and excitement.

How to memorize

When the study is primarily concerned with memorizing, all the suggestions described in connexion with habit apply, for, after all, memory is but a mental habit. There are other factors also which need to be considered. First, the child should realize the need for understanding the material that is to be learned, before beginning to memorize it. He will then be taught to read the entire assignment through, look up difficult words and references, master the content, whether prose or poetry, whether the learning is to be verbatim or not, before proceeding further. Second, he should realize the value of learning by wholes rather than by parts. It will be necessary to return constantly to the whole thought in order to keep clear the relationship of the part to the whole, and to establish the part in the system of ideas which we seek to build up. If children were taught to work in this way, there would be little drudgery about memorizing. The careful, thoughtful study once completed, memorization has been almost accomplished. It is important that the child's attention should be on the result rather than on the technical process. Third, the student must be taught to distribute his time so that he does not devote too long a stretch to any one subject. The value of the principle of distributed learning needs to be explained, and the effect of going over work in the morning, after having studied the night or two nights before, should be emphasized. Fourth, the child should be taught not to stop his work the minute he can give it perfectly. The need for over-learning for permanent retention must be made clear. Fifth, the value of outlining material as a means of aiding memory must be stressed Sixth, he should be encouraged to search for associations, connexions of all types, and even mnemonic devices to help himself to remember facts.

Training to think

The technique for problem-solving has been even more consistently ignored. The child must be encouraged to cultivate the habit of locating the 'vital point' of a problem. The first thing to do is to analyse the problem and see what is required. The recognition and assembling of the 'given' elements or data, is the next part

of the process. Then he should learn to look for the principle underlying it all. The danger of following the first suggestion which offers itself should be made evident. The pupil should be made conscious of the technique of reasoning, analysis, comparison and abstraction. He should also be taught the commonest mistakes in thinking, such as argument from analogy, from limited data, etc. The habit of drawing a provisional inference and of seeking verification should form part of the mental equipment of our children. Rigorous drilling in the distinction between fact and opinion also is part of the duty of the school.

In the securing of information, the problem of the best source will arise. Children must be made conscious of the relative values of various persons as sources of a particular piece of information. Training in the choice of the source of information is very important, both when the source is people and also when it is books. The slavish reverence of the printed page will thus be reduced.

There are certain factors in the criticism and interpretation of a book, sometimes employed by thoughtful adult readers, that would not be out of place if mentioned here. We sometimes ask, before beginning a new book 'Who is the author?' 'What authority has he to be writing on this subject?' 'Is he prejudiced or unbiased?' We even study the author somewhat. We read his preface or introduction to see what he has to say for himself, and for his effort, and his intention in writing. We read reviews and criticisms to see what others, whose opinions we value, think of his work. Such a challenging and critical attitude to print should be steadily inculcated in our pupils. Our schools are not educating until they begin to teach pupils how to study, how to memorize, and how to think.

Types of lessons

We may now turn to consider briefly the different types of lessons usually taught in schools. There are lessons in which thinking of the inductive type is primarily involved, others in which deductive thinking is the end sought, others which seek primarily to fix habits, and still others which tend to promote appreciation. These are more or less distinct psychological types. It ought not to be imagined, however, that these types of mental activity are separate and distinct. Certain lessons tend to involve predominantly one type of activity rather than another.

The inductive lesson

About a hundred years ago there developed in Germany a general method of teaching which has dominated pedagogy more extensively than any other form of instruction. This is the 'inductive development' method of Herbart. It is probably no exaggeration to say that a majority of the teachers and teacher-trainers of this and other conservative countries, as loyal Herbartians, are trying to resist such innovations as supervised study, the Project method, the Dalton plan and other methods as worthless and temporary 'fads'. The student-teacher's notes of lessons all over this country will bear unmistakable witness to the extent and directness of the influence of the Herbartian formula.

This definite formal planning of lessons is one of the characteristic Herbartian ideas. The other is that this plan must work up through induction to deduction. In both these respects the influence has been

wholesome. Proceeding logically in such a well thought out process, is open to little objection, if the learning is a matter of logic. But as a formal method, it has come to be applied to all sorts of materials even where the inductive-deductive logic had no chance to function Herbartian enthusiasts go so far as to identify this one method of a possible variety as 'the method', in fact as abstract 'method', which amounts to assuming that if teaching is not formally Herbartian, it is unmethodical or methodless. All other methods are mere helping devices to the formal logical steps of Herbartian induction!

Herbartian formal steps

In inductive instruction the mind is confronted with a series of distinct, but related details or particulars, that force one to a general conclusion, a definition, a rule, a principle or a formula. In deductive thinking, one takes a rule or formula that has been so developed, or that is taken on authority, and applies it to a series of particular facts or problems.

It is believed that instruction carried out by having the learner proceed, step by step, through a series of five formal phases will cover the circumstances of the learning process. These divisions mentioned earlier may now be taken up separately.

The step of preparation has to do with making clear to the pupil the aim or purpose of the problem with which he has to deal. The skill of the teacher depends upon his knowledge of the previous experiences of the children in the class and his ability to get them to work the problem which remains unsolved in their experience, in such a way as to make it attractive to them. This step then includes the statement of the aim, and providing what is called the 'apperceptive basis'.

1. Preparation

The work of the teacher in the second phase is not very definite. Sometimes, it will consist almost wholly in helping children to recall their past experiences and to apply them to the question in hand. At another time, when experience is lacking, the teacher must direct children to the source of data, guide them in their observations or experiments, or even give them outright all of the data that he can bring to bear on the situation. It is to be hoped that instead of simply having facts presented for their acceptance or rejection, children will be encouraged as far as possible to search for the data which they may need in solving their problem.

2. Presentation

With the problem clearly defined and the data obtained, the next step consists of comparison and the resulting abstraction of the element present in all of the cases. This step is therefore intended to bring together related elements in such a way that the fourth step—generalization—shall proceed out of it as a flashing discovery, a natural conviction, a forced general conclusion. The process of comparison will sometimes involve contrasts, or exclusions—unlikeness which will make the likeness more real. Our success in solving the problem depends on our ability to infer from the facts at our command, Often many inferences will be necessary before we find the one which can stand the test. Such inferring, guessing, is not beyond the power of children. They have been forming inferences and testing them in action since the time that they began to act independently.

3. Comparison and abstraction

When we feel we have solved the problem we are ready to state our generalization. If the desired conclusion does not force itself on the class, the presentation and comparison have not been effective and adequate They must then be reviewed and probably elaborated. The generalization must be a discovery—never a revelation Children should be encouraged to give their own definition or generalization before referring to that provided either by the textbook or the teacher. The best test of adequate comprehension is found in their ability to state the conclusion for themselves. There is very grave danger that if definitions, etc., are given ready-made to children, they will manage to get up a parrot-like repetition. Instead of encouraging children in loose thinking by accepting any statement offered, it would be much better to raise the question of the real significance of the statement, and to inquire just what was meant by the words used.

4. Generalization

There is decided advantage in providing for a definite application of the results of the thinking which children have done as soon as possible, and in as many different ways as is feasible. It makes the truth clearer and helps to fix it in the mind. The satisfaction which comes when one feels his power over situations as a result of thinking, is the very best power stimulus to further intellectual activity. Further, we need to show children the application of that which they have learned to the life they live outside of the school. We have to study diligently to provide enough application to fix in the child the habit of verification by an appeal to experience.

5. Application

The presence of this fifth step makes it seem proper to speak of this method as the inductive-deductive development lesson, as is often done. The generalization, in its final revised form, is applied to new particulars. This method is indispensable in Geometry, Geography, Mathematics, etc. The advantages are economy and effectiveness, but the dangers, if badly conducted, are passivity and superficial learning on the part of the pupils.

The deductive lesson

The complete process of thought involves both induction and deduction. Because of the unified but complicated nature of the mental processes, the individual shifts from one to the other in any complete development of thought.

Briefly stated, the normal order of procedure in a deductive lesson might be indicated as follows: (1) finding the problem; (2) finding the generalization or principles; (3) inference; (4) verification. It is important to realize that here, as in the inductive exercise, the occasion for thought is a problem which ought to be made clear. In the search for the generalization or principle which will explain the situation one must be able to discover that which is essential, and to neglect the non-essential in the problem to be solved. It is often by a process of elimination that children arrive at the right explanation. After they have discovered the principle involved, it is well to have them state definitely the inference which they make. Just as in the inductive process we pass almost immediately from the step of comparison to the statement of generalization, so in the deductive lesson, when once we have related the particular case under consideration to the principle which explains it, we are ready to state our inference. Verification involves the trying out of our inference to see that it certainly

will hold. We have to satisfy ourselves concerning the validity of our reasoning by an appeal to known facts. This may be done by proposing some other inference which we find to be invalid, or by seeking to find another law which will explain our particular situation.

The drill lesson

The drill lesson is so clearly a matter of fixing habits that little needs to be added to what was said in that connexion. If one were to attempt to give in order the steps of the process involved, they might be stated as follows: (1) establishing a motive for forming the habit; (2) knowing exactly what we wish to do, or the habit or skill to be acquired; (3) recognition of the importance of the focusing of attention during the period devoted to repetitions; (4) variation in practice in order to lessen fatigue and to help to fix attention; (5) a recognition of the danger of making mistakes, with consequent provision against lapses, (6) the principle of review, which may be stated best by suggesting that the period between practice exercises may only gradually be lengthened.

One of the great dangers in drill work lies in too large an assignment This results in repetition involving many mistakes. The wise teacher is one who provides very carefully against mistakes on the part of pupils. If drill work is to result in an increase of speed, it will require an expenditure of energy and an alertness on the part of the teachers, and not merely an assignment of work to be done by the pupils.

The appreciation lesson

It is not easy in this case to state the order of procedure. The student is passive rather than active, is contemplating and enjoying rather than attacking and working to secure a particular result. A few suggestions which have been found helpful, however, may be given here. (1) It is of primary importance that the teacher bring to the class an enthusiasm and joy for the picture, music, poem, person or achievement which he wishes to present. (2) Children must not be forced to accept nor even encouraged to repeat the evaluation determined by teachers. (3) Spontaneous and sincere response on the part of the children should be accepted even though it may not conform to the teacher's estimate. (4) Children should be encouraged to choose from among the forms or situations presented for their approval those which they like best. (5) The technique involved in the creation of the artistic form should be subordinated to the enjoyment. (6) Throughout, the play spirit should be predominant, for if the element of drudgery enters, appreciation disappears.

No teacher can get good results in appreciation unless he has a large capacity for enjoyment in the field which he presents to the children. A teacher who can enter into the spirit of child poetry, or of the fairy tale, will get a type of appreciation not enjoyed by the teacher who finds delight only in adult literature. It is also necessary to remember that children only gradually grow from an appreciation of that which is crude to that which represents the highest type. It will be found immensely valuable in the promotion of appreciation if children are allowed to try themselves out in creative work.

The poetic and artistic talent amongst our high school pupils is rarely given opportunity for expression. The poems they can compose if given encouragement, will be an eye-opener to the I-know-it-all schoolmaster.

Such efforts will, to say the least, enable the pupil to notice the niceties and difficulties of standard poems. Nevertheless, it must be repeated that the influence of the teacher in producing an attitude of enjoyment amongst the students is tremendous. Appreciation is caught rather than taught.

Home work

Whenever children are expected to do any work at their seats or at home, the type of assignment becomes a determining factor. It is a mistake to suppose that a minute or two at the end of the period will be sufficient to make clear to the pupils the problem involved in the work to be accomplished. The best time to make an assignment is when, as the subject is developed, the interest of the pupils is at its highest, usually when a problem arises which cannot then be solved. A good recitation ought to culminate in the statement of the questions yet to be answered, quite as much as in a statement of what has been accomplished. Further, it may be suggested that no room for ambiguity or misunderstanding regarding what they are expected to do, should be left, and children should take it for granted that they will be held responsible for the satisfactory execution of the task assigned.

Home study is not satisfactorily disposed of when pupils carry home a load of books. In numbers there is dissipation of effort The common complaint of pupils that they had no time should be faced, and steps should be taken to investigate the cause. Domestic difficulties can often be overcome by the co-operation of the parents Sometimes it will be found that too much work is assigned by the different teachers. Unless the teachers co-operate with each other and come to some sort of an understanding regarding the amount of work each may assign on the different days of the week, boys are likely to continue either to neglect certain unpopular subjects or to do shabby work all round. Such an agreement can be arrived at by considering the number of hours that pupils have for home work, and the number of heavy subjects, like History, Geography, Mathematics, English, etc. If necessary, a system of rotation may be adopted so that every subject that needs to be supplemented by home study, gets its due share of attention.

Exercises

An important task of the teacher in connexion with out-of-school work is the correction of written exercises. In view of the many and varied demands on the teacher's time and thought, the correction of class work and home work is an ever recurring problem. The wise course is not to demand written work in so large an amount that it cannot be carefully gone through at night without intruding upon the time that the teacher must devote to the preparation of lessons. In many cases teachers give too much time and energy to the correction of examination papers, essays and notebooks, and too little attention to preparation for teaching. The very fact that so much written work is demanded often renders the labour of the teachers quite without effect. Pupils continue to make the same mistakes, because the large number of mistakes precludes effective concentration on any one, and it is impossible for the pupil to attack the mistakes in the systematic manner that alone will bring results. If permanent good is to be secured by the teacher's correction he ought to single out certain typical mistakes found in the exercises and deal with them, instead of attempting to correct all the errors. If these prevailing errors are brought to the notice of the pupils in such a way that

they will never commit them again, much will be accomplished. The blackboard may well be used for this purpose. Comparatively little is gained by a chaos of interlineations and marginal comments. In many of our schools if the written work were reduced, the efficiency of instruction could perhaps be greatly increased.

Individual instruction

The problem of adjustment to individual ability has received little attention in India, although educational theory has advanced far enough to concede that the school was made for the child, and approximation towards a child-centric system has become the test of progress. Our entire system of grades and schemes of teaching in classes is based upon the assumption that children are much alike in their capacities and in their ability to respond to classroom instruction. Individuals differ from each other to a much greater degree than has been allowed for in our education.

Individual differences

What we plan and how we plan educational undertakings must always be influenced by our opinion as to inborn traits, sex differences, specialization of mental traits, speed of development, and the respective power of nature and nurture. Pupils differ vastly in the number and type of talents and also in temperaments, imagination, initiative and environmental influences, etc. In order to adjust our schools to the needs of individual boys and girls, our curricula and courses of study as well as our classroom instruction must be markedly different for groups of children who vary in ability.

Some specific features of educational adjustment may be indicated here. All the suggestions are, of course, based on the general assumption that it is the duty of the school to foster individuality and to make every term, day, and period that a child spends in school, of vital importance to his growth and education.

Study each pupil

It is first of all necessary that the teacher should constantly study the general and special features in the nature and life of each child. This study should be made the basis of all the rest of instruction and discipline of the individual Any special abilities which are of value should be watched and encouraged. Any one who reads the biographies of great men, and studies the influences in their childhood which made for their final success, will be impressed by the value of such advice

Adjust class work

The class should be conducted in such a way as to effect every individual. Every pupil should have something to do during the entire recitation. Further, the work should be adjusted to the different individual needs. It must be admitted, however, that there can be only an approximation to these ideals in an ordinary school. But attention given to them is likely to bring about great improvement. It ought also to be remembered that able pupils need less drill material than dull pupils to reach a given standard.

and assignments

Assignments must be made with the needs and special nature of each child in view. In dealing with any ordinary class, the teacher will find that there is much advantage gained by a flexible assignment. It is desirable also to point out special places where the individual is weak and to allow him to overcome such weaknesses as a part of the regular assignment.

Flexible organization necessary.

Even in the most tradition-ridden school, it is possible to focus the attention of the individuals upon their own need. The time factor should be eliminated and attention should be directed to successful accomplishment. Activities and subjects outside the regular curriculum may well be introduced. Enrichment of the bright pupil's school programme may take the form of added subject matter in the ordinary subjects. Further there is always the adjustment that comes from rapid promotion. School organization and school requirements must be flexible enough to be adjusted to meet the needs of each child.

Discovering pupil's needs

Children vary markedly in capacity for acquiring different skills, power to work with speed, ability to grasp meanings, power of imagery, types of memory and the like. The type of adjustment needed can be discovered through the frequent use of diagnostic tests—one of the greatest contributions of modern psychology—and the experience of the teacher with the pupil. A teacher can hardly make a more profitable study than to investigate the problem of individual differences.

Modern tendencies and methods

At the present time experiments are being conducted in progressive countries to individualize instruction to an extent hitherto thought to be impossible. In addition to the Montessori and Kindergarten systems which definitely aim at giving the individual pupil all the attention he needs, there are several plans and methods employed abroad, recognizing the place of the individual.

The Batavia System

There is the Batavia system which seeks to effect a compromise between the individual and class methods. It was organized by John Kennedy, Superintendent of the schools of Batavia, New York, in 1898. It aims to preserve the stimulus which comes from group instruction, and, at the same time, to provide explicitly and systematically for whatever extra instruction the weaker members of the class may need to keep them abreast of the brighter members. The virtues of this arrangement are: (1) It makes individual instruction a definite part of the regular school work. (2) It provides that individual instruction shall be given by teachers who are just as competent as those giving class instruction. (3) It requires the development of a technique of individual instruction which differs in many respects from the technique of class instruction, and which is absolutely necessary for the success of the system. The teacher must discover the pupil's weakness and proffer aid. All individual instruction must be given by the development method. A weak pupil is thus taught to help himself. The main argument in favour of the system lies in the fact that it actually eliminates the 'backward pupil', not, however, by casting him out of school, but by developing him up to the level of the brighter pupils. Measures are taken to check any weakening or softening influences that may be inherent in individual instruction.

The Dalton Plan

The Dalton Plan is better known.[1] Although American in origin it has won even more extensive popularity in Britain. This method of giving adequate attention to the individual is now being tried in a few progressive schools scattered all over India. Some of the schools are attempting a partially Daltonized programme. The

[1] For a full discussion of the Dalton Plan, see next chapter.

basic principle is freedom for the individual pupil to progress at his own pace. Each subject is broken up into units and the student makes a contract to complete an assignment within an appointed time. So there are weekly contracts, monthly contracts, and elaborate checks. The pupil is free to spend as much time as he pleases on any one subject, provided he fulfils the contracts in all the other subjects as well within the specified time. As soon as he finishes one contract he may proceed to the next, without waiting for the rest of the class. Conferences are held with the teacher in different subjects once a week. The plan involves the setting up of laboratories where pupils may find the necessary books. Each subject is given a room. Here the teacher, a specialist in that subject, helps those who come to him for assistance.

The advantages of the plan are obvious. It develops a sense of responsibility in pupils, for the child has a hand in his own education. Time to think is conceded. No pupil is held back because of others. Greater efficiency is secured by setting apart men for different subjects.

There are some possible dangers which must be noticed. Lack of discipline is one. A temporary mastery of subjects on the part of the pupils ought to be counteracted by drill work. Frequent summarizing and short tests will avoid the dangers of learning by bits. It cannot be gainsaid that the social and expressional side of the pupils is likely to be somewhat neglected, and that undue emphasis is placed on the printed page. Nevertheless, with proper safeguards, it may be said to offer a desirable way of escape from the present lock-step system.

The Project Method

The first formal attempt to launch the Project method was made by Dr. W. H. Kilpatrick of Teachers' College, Columbia University, in an article in 1918. His definition of a project was: 'a whole-hearted purposeful activity, proceeding in a social environment.' Stevenson in his *Project Method of Teaching* supplies perhaps the most balanced and consistent discussion of this method. His definition is 'A project is a problematic (involving a problem) act carried to completion in its natural setting.' This method has now been adopted by a large group of Dr. Kilpatrick's students and followers in America and in other parts of the world. In the Punjab and elsewhere in India this idea has taken definite form.

The Project method, briefly described, is that method of teaching which encourages a maximum amount of purposeful activity on the part of the pupils. This activity may be concerned with intellectual problems, with mechanical manipulations and constructions, with physical performances, with appreciations, or with a combination of any or all of these elements, with emphasis upon the social aspect of the situation both as to the worth of the project and the way it is conceived and executed. Round this worthwhile activity turns the learning of the group during that period which may cover even a year.

Every successful teacher has consciously or unconsciously observed four steps in his teaching. He has purposed a particular lesson, planned it more or less in detail, executed the proposed plans and judged or tested the results. The most significant fact about project teaching is that instead of the teacher alone performing these four steps, the pupils have a definite

responsibility in each of the four phases of the procedure. Many teachers fail to analyse the situation in order to be able to discriminate in assuming and relegating responsibility.

The chief advantage of the method lies in the fact that pupils have a definite share in the purposing, planning and executing and testing of their school work. Further it ensures sustained effort on the part of a large number of pupils. The gulf between the different subjects, and between the school and the community life is bridged. It breaks down verbatim cramming and bookishness. It builds up desirable attitudes and encourages the habit of co-operation. Subject matter is considered in its bearing on life activities. Above all it is the natural method of learning.

There are a few limitations to be guarded against. There is the danger of not making adequate provision for drill work and habituation exercises of important skills. It often happens that gaps are left in the knowledge of pupils. Special care needs to be taken from time to time to organize their items of knowledge into a definite system of logical arrangement. Much non-educative activity may be indulged in by the pupils. Learning that is limited to this method is likely to be too haphazard, too random, too discontinuous, too incidental and too immediate in its function to be of permanent value. These dangers can be offset by special care and supplementary methods. In spite of all possible drawbacks, it must be considered to have no rival as a method of preventing school work from becoming perfunctory, mechanical and meaningless. It provides the best conditions for learning. It is learning by doing.

Other experiments

There are some other plans aiming at meeting individual needs which can only be mentioned here. The Central City Plan provides various levels of assignments for the varying abilities of pupils. The Platoon organization represents greater diversification and enrichment of curriculum, rendering it possible to take effective notice of individual differences. Superintendent Washburne of Winnetka is responsible for a system which stands for minimum essentials, individual assignment of tasks, a broader curriculum, and the elimination of the ordinary class periods. The original organizers of the Dalton plan and of the Winnetka technique were much influenced by the teachings of the late Dr. Fredrick Burk, President of the San Francisco State Teachers' College, who did not a little to promote individual instruction in the United States. There is therefore a noticeable similarity between the two methods.

Educational value of play

All activities when indulged in playfully have certain common characteristics. The activity is enjoyed for its own sake. Results may come naturally, but they are not separated from the process. The reason for the enjoyment is not primarily the result, but rather the whole activity. Again, the activity is indulged in because it satisfies some inner need and only by indulging in it can the need be satisfied. The attention is therefore free and immediate. Much energy is used with comparatively little fatigue. Self-activity and initiative are freely displayed.

At the other extreme is drudgery. Its characteristics are just the opposite of these. From an educational point of view it is deadening, uneducative and undevelopmental.

Between the two extremes is work. It differs from play in that the

results are usually of more value, and in that the attention is therefore of the derived type. From drudgery it differs in that there is not the sharp distinction between the process and the result, and in that the attention may often be of the spontaneous type.

Combine work and play

It is fusion of work and play that is desirable in education. Children learn to work as they play. They learn the meaning and value of work. Work becomes a means to an end, and that end, not something remote and disconnected from the activity itself, but as part and parcel of it. Thus the activity as a whole imbued with the play spirit becomes motivated. No great result was achieved in any line of human activity without much work, and yet no great result was ever gained unless the play spirit controlled. Work in and of itself, apart from play, lacks educative power. It is only as it leads to and increases the power of play that it is of greatest value. On the other hand play that does not necessitate some work has lost most of its educative value. To work in play and to play while working may therefore be considered the ideal combination.

The free play of children has its intrinsic value, but with that we are not concerned here. We are interested only in maintaining that school instruction would become more efficient if teachers would only learn to exploit the intellectual and nervous energy released so abundantly, and so obviously in children when the play spirit is operative.

Conclusion: Teaching, an art

A few last words of advice. Teaching is an art that can be well learned only by intelligent and purposeful practice. Like all arts, teaching is based upon fundamental principles or laws which grow out of the nature of the process involved. Many teachers do not understand the principles which lie at the basis of this mental and spiritual process, and not a few, indeed, care but little about basic reasons. They teach in a mechanical fashion. The most efficient and successful teachers go below the surface to learn how the mind actually works, and to get at the reasons for things.

based on scientific principles

Principles of teaching have been discovered not invented. Such are the following maxims: 'Teach one thing at a time.' 'No exercise should be so difficult as to discourage exertion, or so easy as to render exertion unnecessary.' 'Instruction must always proceed from the known to the related unknown, from the simple to the complex, and from the concrete to the abstract.' 'All elementary basic ideas must be taught objectively.' 'Help the learner to teach himself.' 'The matter and method must be adapted to the ability of the learner.' These and many others dealt with in this chapter are simply statements of the way in which teaching and learning go forward, because of the nature of the human mind. All normal minds both of children and adults, function in the same way, and in accordance with basic laws, which are laws of nature and not of man. Applied psychology involves a body of ascertained facts which point the teacher to procedures more or less definite and certain. Every teacher should have some foundation in psychology, and with the principles associated therewith.

All of us feel that a physician needs a thorough course in anatomy and physiology, as well as in materia medica, diagnosis and therapeutics. One who has not the necessary scientific background and yet practises a profession

is called a quack. We have had many quack doctors, but certainly a larger number of quack teachers. This chapter is a plea for the intelligent practise of the art of teaching, and for the reduction of teaching quackery to the minimum.

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CHAPTER 4

THE DALTON PLAN

Change of outlook

The beginning of the present century saw a period of considerable change in educational theories, ideals and methods. Before this time schools were usually organized in classes. The children of each class were expected to progress at the same rate in all subjects. The curriculum and syllabus were the same for all. The teacher was all-important and his work was to see that his pupils covered the syllabus whether they wished to work or not and whether they were interested or not. The method of teaching was mainly expository. Variation in progress by any child was discouraged as preventing the orderly and uniform progress of the class. The main problem of the teacher was to teach a class of approximately fifty children of different aptitudes so that all progressed or appeared to progress at the same rate to complete a fixed syllabus of study in a specified time. To prepare teachers for this task was the main function of the training colleges and must it be admitted that they faced this problem and were often successful in turning out teachers of 'strong personality' who were highly successful in class control, that is, in leading and driving the team of fifty.

The opinion of Rousseau

There had been, however, before this time many voices proclaiming that one child was different from another and that the child was the most important datum in education, but these were voices crying in the wilderness. So far back as 1760 Rousseau had preached that education could be effective only when it was adapted to the particular pupil. With Rousseau the nature of the child was far more important in the learning process than either curriculum or method of teaching. The function of the teacher was more to observe the growth of the child-mind and to create a suitable environment than to 'teach' as teachers now in India conceive the art of teaching. Nor was Rousseau the only reformer in this respect, but the belief that the nature of the individual child must be the chief consideration in the educative process was not generally accepted until the end of the last century. To-day, whilst this principle is rarely disputed, much of our modern school practice in India is certainly divorced from it.

The emphasis placed on the individual

Perhaps the most striking feature of modern educational thought is the insistence placed on the need of the individual child. The child, not the class, is now the unit for teaching, though the class may still be retained as the unit of organization.

Reasons

It is unnecessary here to analyse fully the reasons which caused that change of incidence of attention from the teacher to the individual pupil, which, beginning in the closing years of the last century, reached its height in the work of Dr. Montessori, though some of the reasons may be mentioned. Psychology had become somewhat discredited and the analytical study of 'mind' was giving place to the study of a particular mind. The new psychology was sounding the depths of a child's nature and bringing to light the hidden and powerful forces which determine a child's behaviour and actions. This change received an impetus from the work of

Darwin in developing his theory of evolution. Educationists began to see that the development of an organization depended not only on its environment but also on its own nature. Here we see a reconciliation of the views of Herbart who emphasized the outward forces at work in the education of a child and Froebel who pleaded for the encouragement of his aptitudes and interests.

Acceptance by America

It was only natural that these investigations should lead to a re-examination of the teaching process particularly in America, where the problem of welding a heterogeneous diversity of races into a homogeneous whole was most insistent. Educationists were not slow to appreciate the value of education in this connexion and new schools and changed methods of procedure began to be established, the basis of which was that each individual child must have the opportunity of developing along his own lines through an education based on realities yet consistent with high social, spiritual and intellectual ideals. Old traditions had to be broken, the classes as a unit of teaching to disappear, the restrictions of fixed classroom desks and seats to be abolished, the curriculum to be reorganized in order to bring it into closer contact with the changes due to the rapid development of industrialism. No longer was the tone of a school to be judged by the silence and order in the classroom. Co-operative work was encouraged. The teacher began to lose his early importance as a teacher but became more of a guide, and schools were designed in accordance with the changed methods.

Dr. Dewey was one of the pioneers of this work and in his Chicago University Laboratory school founded in 1896 he attempted to work out the new ideals which he formulated in his many writings.

The Project Method

The Project method about which we now hear so much was one practical outcome of his educational philosophy. By this method the school was brought into intimate relations with the activities of individual children themselves.

The influence of Montessori

But perhaps the greatest impetus was given to individual effort in the development of a child by the work of Dr. Montessori. This celebrated Italian lady was encouraged by her success with mentally defective children to see whether the same methods would not be at least as successful with ordinary children. She found the result exceeded her anticipations. Her school quickly attracted visitors and soon her work became widely known. Indeed Miss Parkhurst, to whom is due the inception of the Dalton Plan, was closely associated with Dr. Montessori in 1915 though she had been working towards a reconstruction of school procedure on the lines of what is now known as the Dalton Laboratory Plan for some years before this.

The inception of the Dalton Plan

Miss Parkhurst describes in her book *Education on the Dalton Plan* her dissatisfaction with the then existent systems of education. She felt that this system was divorced from experience, that schools and colleges were continuing a worthless tradition and did not turn out pupils who were industrious, self-reliant and strong in character. She believed that a different form of training was essential if children were to obtain that moral strength which is so necessary, in addition to reaching a high level of cultural and academic attainment. She had noticed how fine a man was the early American pioneer who though often of little academic education, yet possessed personality, strength of

character and dogged determination in facing problems and difficulties. The reason for this, she concluded, was that contact with the difficulties of life gave an opportunity for the development of initiative and character. She argued that schools must therefore be reorganized to provide opportunities for children to educate themselves without undue interference by facing and tackling problems related to life. The school was to be a laboratory in which children worked out experiments concerning themselves, not a lecture room where they were passive listeners. Miss Parkhurst emphasized the word 'laboratory' and herself called her new organization the 'Laboratory Plan'.

The Dalton Laboratory Plan

Miss Parkhurst tested her plan in various schools and was convinced of its fundamental soundness, though experience caused certain modifications and adaptations to meet difficulties which were found to arise. In 1920 the plan was first introduced into a high school at a town called Dalton in America. Visitors from all over the world went to investigate and see the plan in operation. In English educational circles the Dalton Plan received a warm welcome. Its principles were discussed at conferences and the result of its adoption in different schools formed the subject of much educational literature.

The need for freedom: 1. in organization.

Before discussing the characteristic features of the Dalton Plan it is necessary to emphasize that a pupil must be free to work as he thinks fit. This freedom does not imply licence, which is not freedom at all, but it does imply that the time-table with its arbitrarily fixed periods of time allotted to each subject shall be abolished. The sudden switch from one subject of study to another at the sound of a bell has no place in the Dalton scheme of organization. The child must be allowed to continue his work in any particular subject of study for as long as his interest remains in that study.

2. in work

Another necessary change is that there shall be no longer the silence in a classroom which at one time and even yet is usually regarded as one of the signs of good discipline. Children must be allowed to move about the room, to consult one another, to ask advice or even to work in co-operation. Such collective co-operation towards the completion of a certain purpose gives far more opportunities for the development of the social interests than the usual custom of sitting silently listening to the teacher's exposition.

The Dalton Plan is an organization, not a new method

It must also be remembered that the Dalton Plan is not a new method of teaching or a new curriculum. It is merely a new organization of school work to enable children to learn more effectively than they did under older systems of organization. The class as a unit of organization may remain though it ceases to be a unit of instruction. Under the Dalton Plan the same amount of work as under the class organization is expected of each class during the year, but the method of reaching this result is altered.

Assignments or contracts

In the Dalton organization the syllabus in each subject for the whole year is divided into suitable monthly amounts by the teacher concerned. In this division such questions as holidays, the need for revision at certain stages and other such points are considered, so that the monthly amount shall be commensurate with the

month in which it is expected to be completed. These monthly units of work are called contracts or assignments, and all must be completed in the time allotted. A child who is interested in a particular subject is not allowed to rush ahead in that subject, but he must finish the contract in all subjects of the month before he can receive the next month's assignment of work in any subject.

The promise

Before beginning the first month's assignment of the yearly contract each child usually signs a promise to complete the work, but in some schools it has now been found unnecessary to insist on this.

It is obvious that unless the children understand clearly the nature and scope of the contract, their work is likely to be indefinite and aimless. A most important duty of the teacher after the introduction of the Dalton Plan is to watch and guide each child in his re-adjustment to the altered school environment and machinery.

The teacher —a guide

In the Dalton Plan the class teacher, as such, plays a less prominent part (not a less *important*, as we shall see later) than before, whilst the importance of reference books is greater. The teacher is constantly referred to for advice or help. He must give this help at any time, discuss difficulties, suggest books dealing with topics raised by a pupil, go through and mark the work of each pupil and by help, encouragement, and other ways, must see that each child satisfactorily completes each assignment of work

Subject rooms not classrooms

Under the Dalton Plan the educational machinery requires adaptation to the new system of learning. Instead of 'classrooms' the school consists of subject rooms each one of which is in charge of the teacher of that subject. The class teacher thus gives way to the subject teacher, though for administrative and educational reasons it may still be desirable to regard one teacher as the teacher in charge of a class. Each subject room is fitted for the study of that particular subject. The specialist in the subject is present there during school hours and all books dealing with the subject are to be found therein and not in the school library Thus in the Geography room will be found all maps, charts, geographical apparatus and books dealing with geography. The pupils can enter and leave the room when they feel so inclined and no bells are rung to mark the end of a period as there is no time-table and no limit to the time a pupil may spend in any particular room.

Records of work

In order that each child and each teacher shall know how the work in each subject and in the subjects as a whole is progressing records of work are kept. These take the forms of graphs or diagrammatic representations of the units of work covered in specified times. There are three records, two kept by each child and one by the teacher in charge of each subject. An illustration of the graphs is given on pages 92, 94 and 98 of Miss Parkhurst's book. The graphs enable the child to see exactly the progress of the work in parts and as a whole, thereby enabling him to see whether he is organizing his work and completing it in the time allotted. The teachers' graph which should be hung in his subject room enables him to keep a check on the progress of each child's work and to advise or guide those whose work is falling behind.

The characteristics of the Dalton Laboratory Plan when rigorously followed therefore are :—

Summary of chief features

1. The curriculum is divided into units of work or assignments.
2. Pupils contract to complete these assignments in the prescribed time and are at liberty to study the different subjects how and when they please.
3. The progress of the work is recorded by graphs.
4. Subject rooms replace classrooms.

Many teachers in the west, however, have found by experience that a less rigorous adoption of the Dalton Plan is preferable. They point out that there is still need for the class teacher in lessons of appreciation and inspiration. Such lessons as these must still be given to a class. Again the Dalton system does not give sufficient opportunity for that practice in oral work in language lessons which is so necessary in the learning of a spoken language.

Objections to the plan

There is still a large body of opinion which is opposed to the Dalton organization though agreeing that whenever possible the pupil should progress at his own rate and in his own way. This opposition to the Dalton organization is based on different reasons Some teachers say that the Dalton Plan is unsuitable for any except the cleverer children. They maintain that lessons on new principles or rules in Arithmetic and other subjects are still necessary as without such lessons the average child is apt to be discouraged. In addition to this, such class lessons effect a considerable saving in time. After the new principle has been fully grasped by the children, then comes the time for individual work, for it would be foolish then to expect all the pupils to progress uniformly.

Unsuitable for the average child.

Another objection to the Dalton Plan is that it gives no opportunity for the development of the mind by a rapid interchange of question and answer. Many good teachers speak of the valuable training afforded by discussing problems with the class and building up knowledge of a subject much in the same way as Socrates used to influence his disciples by leading them to examine their knowledge and to express themselves with care and precision.

Oral work discouraged

Some teachers state that the Dalton Plan is not satisfactory for those pupils who are shirkers. In co-operative work they merely copy down the results of others whilst they neglect work which must be done by themselves and so make little progress The supporters of the Dalton Plan point out that such children would make little progress in any circumstances or organization but the Dalton Plan is valuable for them because they are thrown on their own responsibility. Besides, the constant supervision of their record of work enables the teacher under the Dalton Plan to give the necessary stimulus on suitable occasions.

Unsuitable for shirkers

The difficulty of suitable textbooks and assignments has not yet been fully overcome. It is apparent that each subject room must be fully equipped with the necessary reference books and with a wide selection of textbooks, but one book in each subject will still be used by each child as its chief textbook. A school textbook

Difficulty of suitable textbooks

usually presents the subject matter in logical order, though this may not necessarily be the best form of presenting that subject matter to a child. What is the most suitable form of textbook under the Dalton organization is yet a topic of discussion. One teacher prefers one type whilst another teacher prefers another. One book may consist entirely of the subject matter arranged in assignments whilst another book may be arranged with a view to the study of assignments drawn up by the teacher. Indeed some schools have gone so far as to expect children to prepare their own textbooks from the assignments set and from references to different textbooks. There are on the market several series of textbooks written for schools organized on the Dalton Plan. These should be studied by all teachers, if only for the help they give in drawing up one's own assignments. Amongst such books worthy of study are the 'Individual Work Assignments Series' in different subjects published by George Philip & Son and *Assignments in Science* published by Macmillan based on the well-known textbook by Gregory and Hodges.

The adoption of the Plan in India

So far we have been discussing the Dalton Plan generally, and particularly in its application in America and England where its fundamental principles are generally accepted, though its application varies from whole-hearted adoption to timid tentative attempts in one or more subjects. In India, however, additional factors arise which demand consideration before a school can be organized on the Dalton Plan.

The language difficulty

In India the position of English in the curriculum is very important. In the high classes and to some extent in the upper middle classes English is often the medium of instruction in History, Geography, Mathematics and Science, though modern practice is tending more and more to the use of the vernacular as the teaching medium. Thus every lesson in these subjects becomes practically a language lesson for it would be educationally unsound for the teacher of English to insist on correct expression whilst teachers of other subjects pay no attention to faults of language. Again English is taught in Indian schools as a means of communication of thought. Correct speech and clear understanding of the spoken language are very important, therefore considerable oral practice is necessary. This oral practice cannot be economically obtained under the Dalton organization which is certainly unfitted for the teaching of English in the earliest stages, though in certain branches of English, e g. the study of prescribed readers in high classes, the Dalton Plan is not unsuitable. Indeed for the teaching of any modern language, the Dalton Plan is unsuitable as it does not afford sufficient facility for the necessary oral practice in speech or pronunciation.

Unsuitable textbooks

Another difficulty in India is the question of textbooks. There is not yet a sufficient supply of good vernacular textbooks in different subjects, and where English is the medium of instruction and English books are used, the language difficulty again appears because the need of explanation of difficult words and phrases so often arises. The ordinary English textbook is not read with sufficient facility for the pupil to attend to the thought. Before the Dalton Plan can be widely adopted in Indian schools there will have to be a far greater variety of

good textbooks written both in the vernacular and in much easier English than is at present the case.

Unsuitability of buildings

The plan of the school building and the variety of subjects offered by an ordinary Indian high school are great obstacles to the adoption of the Dalton Plan. In the Punjab certainly, many of the high schools are overcrowded both on account of the large number of pupils and the small size of the classrooms. It would certainly be impossible without structural alteration to many classrooms to make them subject rooms or to provide sufficient accommodation for all the students of any one subject. For example, few high schools in the Punjab have nearly sufficient science equipment or laboratory space for the present numbers even when divided into classes. And for such a subject as Geography, which is now compulsory in the Punjab Matriculation examination, the existing accommodation would have at least to be doubled before the Dalton organization could be thought of. It is not likely that managing bodies of schools will provide funds for the necessary extension of the buildings.

The problem of assignments

But even when the size of the school building offers no difficulty to the introduction of the plan, there is in India the problem of suitable assignments In the west, it is possible for teachers easily to see the Dalton Plan in operation in some school reasonably close at hand and to discuss with the teachers the question of suitable assignments. But in India the schools organized on this Plan are very few. There have been attempts, but these have, more often than not, failed. In the *Punjab Educational Journal* for February 1924 is given an account of an attempt to organize a Chiefs' College on the Dalton Plan but the difficulties were found too great and the school reverted to the original organization in classes.

Experiments in Indian schools

The Government of India, Bureau of Education Occasional Report No. 14, *Some Experiments in Indian Education,* gives an account of the introduction of the Dalton Plan into three different schools. The student is advised to study these accounts to see the difficulties met and how they were overcome In the Central Training College, Lahore, the work is organized on the Dalton Plan. It has not been found necessary to take a promise from the students nor to expect them to keep their own graphs. The yearly syllabus is divided into monthly and weekly units of work or assignments. When a student has finished an assignment he takes the work to the tutor in charge who marks it, discusses it with him, and when satisfied that it has been satisfactorily completed, enters a note to this effect on the graph which hangs on the room wall. By an examination of these records the principal and staff are enabled to see which students are falling behind in their work. The assignments are so arranged as to enable the better students to read more widely than the weaker onces though all must complete the minimum amount of work necessary to cover the course. In this Training College many of the difficulties which would militate against the introduction of the Plan into a school are not present. For example, the question of annual promotion does not arise, as the course is of one year. The pupils are few, rooms large and staff stable. There are no skirkers, as the students are all graduates and have entered the college for a special

vocational need in the attaining of a training certificate which will enable them to obtain a post. The main difficulty is that of preparation of assignments. At first there was a tendency to draw up an assignment which necessitated too much marking. Again some assignments were more of the nature of test questions instead of being a guide to the study of some particular topic.

Below are assignments at present in use at the Central Training College, Lahore.

Typical assignments

B T. CLASS

History of Education

ASSIGNMENT I

Textbook, Rusk, *Doctrines of Great Educators*

This chapter deals with education in Greece, which was the centre of all culture Greek culture is the origin of modern civilization. It must be remembered that Greece about this period was not a united nation but consisted of a number of cities each of which had its own ideals of education and its own educational system. This chapter deals mainly with Greek education as expressed by Socrates and Plato Read Rusk, pages 1-6 Also read

1. Monroe, *Textbook in the History of Education*, 52, and, if you have time,
2. Aspinwall, *Outline of the History of Education*, 13-33 and 22-25
3. Graves, *History of Education*, Chapter 12

1 Note three characteristics of Greek thought (One word for each)
(Refer to Browning, *Educational Theories*, 63)

Consider the state of Indian civilization about 300-500 B C. If you have time, try to find out whether each civilization had any influence on the other

2 The Sophists:
- (a) Origin
- (b) Aims
- (c) Opinions.

(Read Monroe, *Source Book of the History of Greek and Roman Education*, 60-64)

3. Socrates Prepare a short account of him and his influence on Greek thought What was the Socratic method?

Note (a) Its characteristics.
(b) Its possible use in education
(c) Its criticism by Pestalozzi (You will read about this educationist later)

Read (1) Fitch, 'A Socratic Dialogue,' in *Lectures on Teaching*, 16.
(2) Monroe, *Textbook in the History of Education*, 120-7

B T. CLASS

History of Education

ASSIGNMENT II

Quintilian

1. Prepare a brief life history (Monroe, *Source Book*, 445-6, and *Encyclopædia Britannica*)
The Institutes—full textbook of education.

2 Note difference between philosopher and orator Rusk, Chapter II, par. 3, Monroe, 61-64

3 Read the main characteristics of and difference between Roman and Greek education Monroe, 9-16, 58-60, Rusk, Chapter I, 8
Monroe, *Principles of Socratic Education*, 16-26

4 The orator Note definition and Quintilian's wide meaning (par
(a) Natural endowment pre-supposed (par. 5).
(b) Good voice, health and bearing.

Training
1 Home education up to 7 years
2 General Training
3 Special Training
4 Home education Both parents to be cultured Compare Plato, and the present condition of India.

(Did England make a mistake when she started education for boys and not for girls in India?)

1 Reading, speech training, writing
N B (a) Method of teaching writing
(b) Arguments for public schools versus private education
2 General education.
Greek and Latin. Why Greek?
Grammar, literature, correct speech, and writing
Music and Harmony of voice and body, Gymnastics, Geometry, Science
3 Special Training
Choice and management of ideas, expression, style. (The art of speech and writing)
Note —The teaching of writing (page 42).
Cp Modern views
The need of recreation (page 44)
Quintilian's view of corporal punishment (page 44)
The question of time-table
Cp Dalton Plan (page 48)
The influence of the teacher (page 49).

Questions for consideration and discussion —

1 What does the term 'orator' signify to Quintilian?
2 What was the aim of education according to Quintilian? Summarize his views on the education of the Roman boy
3 Mention any of Quintilian's anticipations of modern ideas or methods of education
4 Contrast the Roman and Greek views of education for women as given by Quintilian and Plato.
5 What did the ancients mean by Gymnastics?
6 What do you know of the Philosophers, the Sophists, the Orators?
7. Give Quintilian's views on (a) the influence of the teacher, (b) corporal punishment
8 Compare and contrast the Greek and Roman ideal man and the nature of the education to produce him.
9 What reason can you give to assume that Quintilian would (or would not) have been a supporter of 'simplified' spelling, had he been living now?
10. What do you mean by the doctrine of 'formal discipline'. (See Monroe, *What is Education*, Chapter III, or almost any book. Adams, *Herbartian Psychology*, 107)
11. Plato details for us the education of the philosopher, the former education for speculative life, the latter for practical life. Discuss. (Ref. Rusk, 39)

B T. Class

Geography

Assignment No VI

Climate of India

In a blank map of India insert the January isotherms of 80°, 75°, 65°, and 55°, and in another map insert the July isotherms of 90°, 85°, and 80°

Read par 233 of textbook and examine carefully the isothermal map Discuss difficulties with the lecturer

Which parts of the plains of India are the hottest and which the coolest in July? Give reasons for your answer

Find out the approximate January and July temperatures of Delhi, Madras, Shikarpur and Lahore

What is the July temperature of Simla as given in the isothermal map? What is the actual July temperature of Simla? What is the reason for the difference?

Why are isotherms not parallel to the lines of latitude? (See par 113)

Draw a temperature graph from the following figures —

(F degrees)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov.	Dec.
Lahore	54	57	69	81	89	94	89	87	85	76	63	55
Calcutta	65	70	79	85	86	84	83	82	82	82	70	62
Allahabad ..	61	66	77	88	93	93	86	84	84	79	69	62
Madras	76	78	81	85	90	90	87	86	85	82	79	76
Simla	40	41	50	58	60	64	63	62	59	52	45	38

Which place is hottest in July and which the coolest? Give reasons

Which has the greatest range of temperature? Why?

Which place has the least range of temperature? Why?

Why has Calcutta a greater range of temperature than Madras?

Why is Allahabad hotter in summer and cooler in winter than Calcutta?

Read Morrison, *Indian Empire*, pages 46 to 49. Note carefully that in describing the climate of any place, its summer and winter temperatures, the amount and season of rainfall, the direction of winds, and the causes of all these are to be mentioned

Describe the climate of: your own town, Lahore, Srinagar, Simla, Quetta, Madras, Calcutta. Give causes in each case.

The main aim in drawing up these assignments was to guide the reading of the students whilst the questions at the end of Assignment II (History of Education) form subjects of discussion and also give practice in arranging ideas with a time limit. Written answers of all the questions are not expected of each student, because it would be impossible to mark them thoroughly.

Other examples of assignments

Examples of assignments in use in Indian schools can be found in the Bureau of Education Occasional Report No. 14, though in the English assignments given, some of the exercises will require class work and discussion as the answers could hardly be found from books. One instance is No. 2 at the foot of page 14.

Name the different kinds of diffuseness in the following.—

1 It was the privilege and the birthright of every citizen to rail aloud and in public.
2 They returned back again to the same city from whence they came forth.
3 Cromwell left behind him a name not to be extinguished but with the whole world.

Other typical assignments for schools are given below.

ALGEBRA (CLASS IX)

To factorize expressions of the form x^2+bx+c (one unit).

1 Multiply $x+2$ by $x+3$
2 Note—the co-efficient of x in the product is the sum of 2 and 3, whilst the term without x is the product of the same two numbers 2 and 3 This will always be the case.
3 Take any expression like the above from your textbook and factorize by finding two factors which when multiplied together give the numerical term and when added give the co-efficient of x.
4 Example: factorize x^2+7x+6 Find two factors of 6 which when added make 7. The factors are 6 and 1 (not 3 and 2)—Answer $(x+6)(x+1)$
5 Work all examples (orally if possible) of this kind in your textbook Take any one that gives difficulty either to the teacher or to another boy.
6 See if the same rule holds for examples with negative signs, such as x^2-5x+6 or x^2-x-6 or x^2+x-6

ENGLISH (CLASS X)

The Poem 'John Gilpin'

These notes are (1) to assist you to understand and appreciate the poem, (2) to encourage you to think about what you read

Notes and Exercises on the Poem 'John Gilpin'

In order to understand and appreciate this poem, we must know something about its 'setting', i e. the time and place in which the events narrated are placed. The place is London and the time the middle of the eighteenth century In those days London was very different from what it is to-day It is not one-twentieth of its present size, and Edmonton (stanza 3), which is now part of Greater London, was then a country village. (It is about eight miles from Cheapside—stanza 11—which is a street in the heart of the business quarter of London)

In those days, the only ways of travelling were on horseback or in vehicles drawn by horses. (Bullocks were not used for this purpose in England.)

The city roads were roughly paved with stones (stanzas 11 and 20), and the country roads maintained, not as now, out of rates levied by the local authorities, but by means of tolls, i e fees levied at fixed points along them (cf Octroi Posts). To ensure that every traveller paid toll, the roads were closed at these points by gates called turnpikes, and the keepers of these gates, whose business it was to open them, after receiving the toll, were called turnpike-men

But then, as now, Englishmen were very fond of sport, especially of horse racing, and so we find that the turnpike-men, thinking that Gilpin rode a race, threw open their gates at once without waiting for payment

We now come to the poem itself

STANZA 1 —After reading the first stanza and the notes on it below, state in a single sentence what John Gilpin was, substituting a single word for 'Citizen of London Town'. 'Credit and Renown'—of creditable renown, i e of good reputation. 'Credit and' has here the force of an adjective. Similarly we say, 'It is nice and cool to-day' meaning that it is pleasantly cool We do not mean that it is a nice day, it may, e g. be raining heavily Credit here does *not* refer to Gilpin's financial position. In fact we learn from the poem itself that he was a comparatively poor man. (Stanzas 2, 6 and 13, 14)

From STANZA 2 we learn he had had no holiday for thirty years; from stanza 6 that he has no horse, almost a necessity in those days, and from stanza 14 that he had no assistant to carry on the shop in his absence. If you do not appreciate the significance of these facts, ask the teacher.

'Train-band'—the earliest bodies of volunteers were called train-bands.

STANZA 3 —'The Bell'—in those days all inns were distinguished by painted sign-boards, either hung over the front door or suspended from a pole in front of it (Even nowadays many inns, especially in the country, have such signs) The inns took their names from the person, animal or object depicted on the sign, e.g. 'The Marquis of Granby', 'The Red Lion', 'The Golden Cross'.

'Chaise' (Pron. shays, 'ays' as in 'days'). Strictly a two-wheeled conveyance drawn by a single horse and seating only two persons. It is, however, used loosely, as here, for horse carriage in general.

STANZA 4 —'After we'—It must not be supposed, as students are apt to suppose, that a great poet like Cowper writes bad grammar in order to rhyme.

Uneducated English people often use the objective case of pronouns in the place of the nominative and *vice versa.*

These words are put in the mouth of Mrs. Gilpin, and a shopkeeper's wife in the eighteenth century would certainly not be well educated.

STANZA 6 'Linen-draper.—Linen is a fine cloth made from flax Then such articles as shirts, tablecloths, sheets, etc, were made of linen. We still speak of body-linen, table-linen, and bed-linen though the articles in question are often made of cotton now. Can you explain why?

'Calender'.—(Note the spelling of this word.) One who prepared cloth for sale by smoothing and pressing it. There are no calenders now. Why is their work no longer needed?

STANZA 10. ' All agog '—Very eager Note this use of ' all ' and give other examples ' Thick and thin '—the country roads then were what in India we should call ' kacchha ' In some places there would be thick mud, in others muddy pools

STANZA 13 ' Saddle tree '—Literally the wooden framework of the saddle, here used for the saddle itself Another example of the same figure of speech (part used to denote whole) is grey-beard, meaning old man Give other examples

STANZA 16 ' Good lack ! ' (a substitute for ' Good Lord ' !)— a meaningless exclamation.

STANZA 25 ' Neck or nought '—very recklessly. ' Wig '—an artificial head-covering made of hair In Gilpin's time it was the fashion for men to shave their heads and wear wigs Who now wear wigs in England as part of their official costume ?

STANZA 29 ' To run a rig '—to do something unbecoming. ' He carries weight '—when men or boys race, the better runners are handicapped by having to start behind the less good. In horse races all horses start from the same point but the better horses are handicapped by having to carry so much total weight.

STANZA 30. ' In a trice '—in a moment.

STANZA 31. ' Reeking '—literally means smoking. What does it mean here and why ? (cf. stanza 32)

STANZA 34. ' Wash '—a stream.

STANZA 35. ' Mop '—a bundle of pieces of cloth tied to the end of a pole and used for washing floors and walls To trundle is to rotate. What happens when you rotate a mop saturated with water ? How did Gilpin resemble a ' trundling mop ' ?

STANZA 39 ' Like an arrow ', ' So did he fly '—these are different figures of speech How do they differ and why are they named ?

STANZA 44. ' My hat and wig . . . upon the road '—this joke depends upon the wilful confusion of the two meanings of ' upon the road '. (What are they ?) Such jokes are called puns Give other examples of puns

STANZA 51. ' Bootless '—unprofitable

STANZA 54. ' Posting down '—in those days the mails were carried on horseback and the carrier of them (called ' post-boy ') had to ride at full speed. Hence ' posting down ' means ' riding like a post-boy '. What figure of speech is involved ?

We often use the expression ' post-haste ' even nowadays

Post-boy was also used to mean postillion, as in stanza 58. A postillion guides the horses of a coach by riding one of them

STANZA 57. ' He frighted '—in the eighteenth century ' to fright ' was used where we should now say ' to frighten '.

STANZA 59 'Hue and cry '—used both for a party pursuing thieves and the shouts raised by them.

STANZA 60. ' A highway man ! '—in those days the police system was very inefficient and the highways, i e the main roads between towns, were infested by mounted robbers who were known as highwaymen.

Exercise :—Put into your own words the conversation between John Gilpin and his wife in stanzas 2-7 inclusive. Then turn what you have written into the indirect form of speech.

Words such as ' spouse ', ' frugal ', ' braced ', etc , which you may not know, but which present no difficulty, are omitted to compel resort to a dictionary.

In short the difficulties confronting the organization of an Indian School on the Dalton Plan are :—

Difficulties summarized

1. The problem of English.
2. Conservatism of teachers.
3. Unsuitable school buildings.

4. Difficulties of accommodation, in view of large number of pupils and the many subjects in the high school curriculum taken as optionals or electives in the Matriculation examination.
5. Lack of suitable textbooks.
6. Instability of staff.
7. Rigidity of annual promotion regulations.

But these difficulties should not daunt a school from considering whether the Plan cannot be applied in some subjects or in some classes.

The Plan is elastic

The partial adoption would be quite possible, for the Dalton Plan has the merit of elasticity. A beginning might be made in the upper middle classes or in the lower high classes, for at this stage the pupils might be expected to undertake their own study. If the whole of the major subjects are 'Daltonized' the time-table should be arranged to leave the mornings free for private study whilst the afternoon periods could be retained for lessons. It may however be considered desirable to begin with subjects. The most suitable subjects appear to be Science, Mathematics, Geography and History. In Indian schools, however, it will probably be found necessary to have occasional lessons even in these subjects and in topics or rules which give general difficulty or at the beginning of new lesson-wholes. The value of inspirational teaching too in such subjects as Literature, History and Poetry is great and such lessons or lectures are very valuable. In the Central Model School at Lahore, Science in the high classes is taught wholly on the Dalton Plan and the teachers are fully convinced of its superiority over the old class-teaching. But each school should see what is possible and adapt the plan so as to overcome the difficulties peculiar to that school.

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CHAPTER 5

THE TEACHING OF THE MOTHER-TONGUE

GENERAL

The mother-tongue occupies a unique position in the school curriculum. It is unique because it is fundamental: on it depends the efficiency of every other subject; on it depends the efficiency of the total result of the education.

The importance of the mother-tongue

People are inclined to think of language merely as a means of expressing thoughts. This is not true: language *is* thought. As soon as one gets beyond those elementary ideas which can be expressed by mere sensory images, words become indispensable. They are the coinage of thought. Simple transactions may be conducted by barter of actual goods, but all the complexity of modern commerce depends upon money-tokens which are symbols of value: so also, as soon as one gets beyond the simple representation in the mind of objects or occurrences, into the realm of reasoning and abstraction, some system of word-tokens becomes indispensable.

Let us suppose that the soul (and mental power) of a distinguished scientist on re-incarnation were reborn as a baby in a Hill Tribe possessing a language with a vocabulary of some two thousand words. It would not be possible for that child (unless he learned some other language) to develop his natural powers. He might become Priest or Medicine Man of his tribe, but his full mental capacities would necessarily largely remain dormant, for he would not possess the verbal nucleus round which to frame his thoughts. One cannot get far in science if one has no words accurately to express the different concepts of Weight, Mass, and Momentum. Nor can one form these concepts without words on which to crystallize them. In short, not having a language, he would have to make a language for himself.

So, too, a Shakespeare reborn in such circumstances might add a little to the tribal songs, but he could never reach his fullest possible refinement of emotion: his verbal means would not permit him to feel it. *Translate into Garo:*

> For aye to be in shady cloister mewed
> Chanting faint hymns to the cold fruitless moon. . . .

Neglect of the mother-tongue

It is a notable fact that the first edition of this book contained no chapter on the mother-tongue. There has been a tendency to neglect the mother-tongue,—not merely in India, but in all countries. It is unnecessary here to discuss in detail the causes of this neglect.[1] In India this tendency has been particularly marked, because in India there is a special temptation. There is a tendency in this bilingual country for the importance of the mother-tongue to be overshadowed by the urgency of English.

[1] See West, M., *Language in Education*, ch. ii. 18-24.

We may admit that, whereas the English boy's mother-tongue, English, supplies almost all his linguistic needs, the Indian's mother-tongue is usually only partially adequate and English is needed as a complement. Hence for the Indian child the mother-tongue has not, perhaps, the same overwhelming importance. On the other hand it is to be remembered that the vast majority of Indian boys never do actually learn very much English, and the sphere in which their English is used is very limited,—a matter of business or official communication and technical discussion. For all other things, for the ordinary affairs of life (which are in fact so important) and, above all, for the emotional and feeling aspects of life (which are the most important), the mother-tongue remains the indispensable medium. A foreign language is incapable of expressing these things. The words of a foreign language cannot express the details of a social environment very different from its own. (It is impossible to describe an Indian household in English without introducing almost thirty per cent of Indian words.) Moreover, in respect of expression of the feelings, the words of a foreign language can never possess the emotional value of those mother-tongue words acquired in infancy when the foundations of the emotional life were being laid down. In neglecting the mother-tongue in India in favour of English we are like the young wife who brought so many jewels that she had no money left for clothes or food.

There is yet another consideration. English is begun ordinarily at the age of eight or nine. This is too early, and as a result we see children endeavouring to learn a foreign language before they have mastered their own. We find children tackling an English reading-book who are not able to read and understand a story in their mother-tongue. They waste time acquiring through English the fundamentals of grammar, and those basic skills of reading and understanding which are the same in all languages and could far more rapidly and effectively be acquired in the mother-tongue. And the consequence is that they learn neither language effectively.

The best way of ensuring a rapid and accurate mastery of English is to lay a sound foundation of knowledge of the vernacular first.

A general responsibility

We have said that the mother-tongue is fundamental, it is not a mere subject by itself; it is the foundation of every subject. A student who does not think and express himself clearly cannot become good in History—or in Science—or in Geography. Hence the History- and Geography-teachers, finding their pupils hampered in these subjects by their weakness in the vernacular, turn round and blame the Vernacular-teacher. This is entirely wrong. The Vernacular-teacher cannot in his one period exert such an effect on the expression of his pupils as will carry over the other five lessons: nor indeed is it of any use for him to train children to speak and write accurately in his one period, if they are allowed to speak and write in as slipshod a manner as they please during the rest of the day. All teachers must co-operate; every lesson is a lesson not merely in its own subject but in correct expression also. Every piece of work written in the vernacular must be accurately written whether it is intended for the eye of the Vernacular-teacher or not.

One idea emerges from this, a strange idea to the Indian headmaster—almost a laughable idea. It follows that the premier teacher in the school,

the class-master of each class, who is generally responsible for all their work and conduct in all subjects, should be the Vernacular-teacher. The poor despised *pundit*, the butt of boys and teachers, the lowest paid member of the staff, is really the most important teacher in the school! . . . Why, then, do Indian headmasters appoint a 'poor despised' person to a post of so great responsibility? Why do they make him poor? . . .

Two functions: receptive and expressive

A language has two functions; it is a means for receiving ideas (the receptive function); and it is a means for conveying ideas (the expressive function).

Our purpose in teaching the mother-tongue is therefore two-fold.

1. *Receptive.* (a) We aim at enabling the child to gather knowledge and thought by means of listening to, or reading, his mother-tongue.

(b) We aim at enabling the child to respond to noble emotions conveyed through books (or speech) in the mother-tongue.

2. *Expressive.* (a) We aim at enabling the child to convey ideas accurately in his mother-tongue, so that the listener will precisely understand the thought in the mind of the speaker or writer.

(b) We aim at enabling the child to ennoble his emotional life by noble expression of it. (We share our crude impulses in common with the beasts of the field: the difference between man and beast is that man restrains and purifies his feelings, attaching them to worthy objects, combining them into noble sentiments, and repressing those which are ignoble. All this is pre-eminently a function of language, which reveals ourselves to ourselves, conserving and recording that which is good, and making us ashamed of and eliminating that which is base)

The defects of the present system: 1. in the teaching of reading

The main defects of the present system are on the side of Reception: indeed this aspect of the language is ordinarily completely forgotten. Some few teachers get their pupils to express themselves decently in the vernacular, but very very few think of forming a taste in reading. Ordinarily one small textbook is prescribed, no more than an educated man could read from cover to cover in half a day; and this miserable little pill of language is chewed and masticated for a whole year.

Let this be clearly stated at the outset: that *there is no place for any set textbook in the teaching of the mother-tongue* (save, in the lower classes only, a book of really good selections for training in reading aloud).[1] Of detailed textbook study, there should be *none*. Reading of prose is taught by supervised library work,[1] or by drill in silent reading using a number of story books taken from the library. Appreciation of poetry is taught by reading aloud.

If the reading material used in the lessons is properly selected and is not too difficult for the class, there is no need for detailed microscopic study and a paraphernalia of notes. The book is in the children's own language, written by their own countryman for his own countrymen—for *themselves*: he must be a poor writer if he cannot make himself understood without a paraphernalia of notes. Indeed such detailed 'chewing' of a literary text

[1] See page 77.

defeats the very object of the course. Our purpose is that the children should learn to love and appreciate the literature of their mother-tongue: but such methods teach them to loathe it.

[We do not suggest that great works should be perfunctorily skimmed through. Some literary masterpieces require more digestion than others. For just so long as this 'digestive' process continues to lead to increased appreciation and enjoyment, it is justifiable—not a minute longer. But the tendency is to give children adult literary food just so that they may have to do plenty of digesting; or perhaps to save the parent's pockets or the school finances in buying a reasonable and adequate amount of more suitable provender.]

2. in the teaching of composition

The teaching of composition divides itself into two separate parts, which need to be clearly distinguished. (1) There are certain things which the child will in adult life be required to communicate to others; and (2) there are certain things which the child will want to express largely for his own satisfaction. Thus composition serves two functions, the conveying of ideas to others, and the expression of ideas and feelings for one's own pleasure. The first type of essay may be called 'The Communicative Essay'; the second 'The Expressive Essay'.

Any essay subject set in the classroom should fall clearly under one or other of these headings; but the majority of subjects actually set fall into neither class. It is almost impossible to conceive of a situation in which the child will be required to deliver a sermon on 'Honesty is the best policy' or a non-technical lecture on 'The Cow'. Neither is it in any way probable that the child will feel an inner urge to expression on these subjects merely for his own satisfaction.

In the first class of essay three points are of especial importance:—

The communicative essay

1. *Definition of the Audience.*[1] The child is required to convey ideas. *To whom?* Let us suppose that the subject set is, 'Describe your home': it makes all the difference whether that description is intended for an absent brother, for a friend in England who has never visited India, or for a prospective purchaser. Every such essay subject must therefore state implicitly or explicitly its supposed audience or reader: otherwise it is meaningless.

2. *Knowledge of the Subject.* This second point arises from the first. It is unreasonable to require any person to convey information on a subject of which his reader knows more than himself. There are very few subjects on which *all* the members of a class of children do know more than any other person, and most such subjects involve an imaginary reader whom the children find it difficult to visualize (e.g. the imaginary friend in England); moreover they are subjects so 'polarized' by familiarity[2] that they are far more difficult to write about than the unfamiliar. And they are, by reason of their familiarity, very dull to write about.

On the other hand there are many subjects on which each individual child is better informed than the rest of the class. One boy has gone a sea-trip; one child was once in a house on fire; one keeps rabbits, another is an

[1] See Hartog, P J, *The Writing of English*, 7 and 8.
[2] Chesterton, G K, *Life of Charles Dickens* (1910), 1-2; West, M., *Bilingualism*, 225

amateur carpenter. This fact is the basis of the excellent idea of Littleman Lectures, devised by Caldwell Cook.[1] In its original form each boy prepares a five-minute lecture to the class on some subject which he knows especially well, and which is likely to be interesting to the rest.[2]

3. *Accuracy.* The purpose of the communicative essay is—to communicate. Few people realize how vague and how liable to misunderstanding their communications are: they believe that, because a passage is clear to themselves, it is therefore clear to other people; and, if there is misunderstanding, they assume that the fault must lie with the reader. One of the first things which the essay course should demonstrate is the ease with which a statement may be misunderstood, the immense difficulty of being clear beyond possibility of misunderstanding. This may be done in the Littleman Lectures by encouraging the listeners to object to any statement which they do not readily understand. A little wilful denseness on the part of the teacher in correcting the written essays is also helpful.

Do not, however, allow the children, in their attempt to be clear, to become verbose Clearness is not a matter of number of words; it is a matter rather of choice of words and consideration for the 'apperceptive mass' of the reader. Above all it is a matter of knowing from the first precisely what one wants to say. For this reason one of the best methods of attaining clearness is repeated rewriting. The first time one writes the essay, one is not quite sure what one is going to say, there is some trusting to the inspiration of the moment. Write it out again, and one now knows what is to be said, and the only purpose now is to make it clearer.

(It is extremely desirable in all essays to state the precise amount which is to be written. This not only saves the teacher from an impossible burden of correction, but it also teaches the children to adjust their substance to the time and space available, and to concentrate on quality rather than quantity.)

One of the best ways of teaching clearness is to set certain types of composition in which the reader is very liable, or even definitely eager, to misunderstand, for example, Rules, Laws, Official speeches, Tactful letters, Business agreements. Some examples are given below.[3]

Selected exercises of this kind may be criticized and emended word by word in the class.

The expressive essay

The expressive essay is the type which the child writes for his own satisfaction. He is here entering into the spirit of the literary craftsman; he becomes thereby the better able to appreciate the master-craftsmanship of the great writers, and, even in his humble literary efforts, he gains something of that refinement of feeling which they have attained.

Five points are specially to be noted in connexion with this type of essay.

1. Such work is of no educational value unless it is accompanied by some feeling of satisfaction; that is, unless the child takes some pleasure in it.
2. The greatest pleasure is derived from such work where it is communicated to and appreciated by an audience.[4] Hence it is necessary

[1] *The Play Way*, ch. iv, 80-140
[2] See above, page 5. [3] Page 80.
[4] Richards, I A, *Principles of Literary Criticism*, ch. iv, 25-33.

that such writing should be just as technically and grammatically perfect as the communicative type; indeed more so—for when we communicate we may be understood even though our form of expression is ungraceful or unconventional; but, if we are ungraceful or unconventional in the expressive essay, the pleasure of the reader is marred, and thereby our own.

3. When we express, we express ourselves, our own individuality. Individuals differ. It is not therefore to be expected that all the individuals in a class will derive satisfaction from writing on the same subject; indeed the greater the freedom of subject, the greater will be the individuality of work, and hence the greater the pleasure. On the other hand one cannot expect an untrained class to blossom out with ideas: they must be led on. The best method of encouraging the development of individuality is the provocative or suggestive subject.[1] Any child who prefers to write on a self-chosen subject, is at liberty to do so.
4. An essay of this kind is usually of some length. It is best to let the child draw out a scheme and write it part by part, each corrected part being rewritten and submitted with the new addition. The rewritten sections may be kept in a separate book so as to preserve the continuity of the finished masterpiece.
5. There are some children who are really quite devoid of literary gift they have probably some other favourite form of expression—drawing, or music, or manual occupations. We must not imagine that, because a child at the first start, shows no aptitude, he is therefore sterile; yet there are some few who are actually, after adequate experience, found to be both incapable of and (what is worse) uninterested in verbal self-expression. It is no good forcing such: they may develop later. For the present it is best to set them simple subjects of the communicative type only.

Letter-writing

Every child, whether he has literary gifts or not, will be required in after-life to write letters, both business and personal. Instruction in this art may therefore be considered as the first and most essential duty of teachers of the mother-tongue. It is not necessary merely to teach the correct forms of address (so carelessly and incorrectly used by many), it is also necessary to teach such elements of politeness as the use of clean and decent notepaper, and the correct affixing of the stamp.

In regard to the business letter our remarks on the communicative essay apply. Its purpose is to be brief and unmistakably clear. Business jargon is to be avoided

The personal letter falls rather into the expressive group, and it is a particularly difficult type of writing. Its purpose is to express oneself in order to convey oneself to the absent friend and establish a *rapport* (feeling of mutual sympathy). Some letters are selfish, mere autobiographies or self-analyses; they seem to neglect the reader: they might be pages from a locked diary intended for no eye in particular. Others are unselfishly dull, mere strings of inquiries and pious wishes: they seek to get, while giving nothing.

[1] See the list of subjects on page 81.

Both kinds miss their purpose. A letter is an outstretched hand of friendship, giving eagerly, and hoping for (but not demanding) a responding gesture of affection. The pure art of it cannot be practised in the classroom, but the elements of its technique can be. A perfect letter is not a disjointed chain of news-items, but a unitary work of art: the recent events of the letter-writer's life are treated selectively and representatively, a different choosing, and a different aspect of them for each recipient.

Individual treatment

It will be gathered from the above that the teaching of the mother-tongue is (except in its earliest stages of elementary linguistic training) very largely a matter of supervised individual study. All children do not want to read the same books; nor are all children able to or eager to write about the same things.

Ordinary class methods are therefore in a large measure inapplicable: the class goes on with its work while the teacher calls up children one by one; and some perhaps are interviewed after school.

Apart from elementary drill three parts of the work only are amenable to class treatment.

1. The communicative essay—teaching a thing which all have to do.
2. The mass appreciation—mass recitation of poetry, where the co-operation of all heightens the individual effect.—So also the co-operative reading of a play
3. As shown above, much of one's individual appreciation is dependent on the response of one's fellows. There is greater pleasure in reading aloud to a group than alone in one's own room. Half the pleasure of the expressive essay lies in the response of a reader Hence in much of the class work in the mother-tongue the class is acting as audience or critic to its individual members, and thereby developing the critical faculty and taste of all.

Grammar

In the elementary stage the general principles of grammar need to be taught, namely the parts of speech, the agreement of verb and subject, the analysis of sentences, and such other things which apply to all languages. These should not be taught before the ages of nine or ten, since they involve certain abstract ideas difficult to the very young mind. Nor need a vast amount of time be wasted on them: the actual amount which has to be taught is very small, and, provided that adequate exercises are given and time not lost on long muddling explanations, the children should not take much time to grasp the essentials.

Beyond this initial course *no formal or separate teaching of grammar is necessary*. Such grammar as is taught should arise out of the prevention or correction of errors in the children's own exercises. Thus, if the teacher sets a conversation as an essay subject, he will preface it by a lesson on the use of inverted commas. If he sets the report of a debate, he will preface it by some drill on indirect speech. If any particular error, or type of error, is found to be prevalent in the children's writings, the teacher will devote a period to its discussion—and to practice-exercises aimed at eliminating it.

With secondary school children good grammar in the mother-tongue is, or should be, the normal state of health; bad grammar an occasional disease due either to a lack of resistance on the part of the child or to a particularly virulent infection.

These remarks apply also to good spelling and good punctuation.

By a 'virulent infection' we mean a specially difficult point. In all cases of doubt the child should consult a dictionary, or consult the teacher. Given this standing and open invitation, there is no further excuse for errors. 'If you did not know, why did you not find out?' But there are some traps so subtle that the child may not know that he is in danger: such points are few, and when detected deserve a special treatment in the period devoted to the discussion of essay work.

The vast majority of the mistakes which children make are not due to ignorance at all, but to carelessness or to confusion. If a child's essay is handed back to him to correct himself he will in most cases be able to detect about one-third of his own errors. If the errors be merely underlined by the teacher he will be able to set almost all of them right without any assistance. Why then did he make them? Because he was interested in what he was writing and wanted to push on; or he wanted to get the task done so as to go out to play; or because his exercises are not usually corrected carefully, and he hoped that these errors would escape detection; or, most probably of all, because he does not know what real accuracy means. And in many cases the teacher does not either.

The test of real accuracy is: 'May this paper now go to the printer and be printed *exactly as it stands*?' (That is—apart from printer's errors—there will be *nothing* to correct in the proofs): there would be no need for a competent printer to submit a proof: it may be, as it were, *photographed into type*.

It is a good thing in this country of cheap printing to have an occasional essay of the children printed in order to make them realize what accuracy means. Either there is, or there is not, a comma at this place: now which is it to be? It is no good leaving it to the printer's discretion. It is no use writing a word badly because you don't know how to spell it: the printer is a machine, and what you write, he prints; and if the error is your fault, you must pay him for his time in altering the type. It is cheaper to correct manuscript than to correct lead type.

It is also a good thing to hand back all the essays to their authors and make them look through them yet once more and write at the top '*Correct and Ready for Press*'.

It is a good thing for the teacher to go on strike occasionally, and say, 'I am tired of correcting mistakes which you can correct yourselves. Change books and correct each other's essays. If in doubt, ask me.' This is a very good exercise, for it also trains the eye to detect errors.

Another cause of inaccuracy is confusion. This type of error is found rather in English, a foreign language, than in the mother-tongue; but it may be found in the mother-tongue also, especially where the children are trying to write in a stilted and unnatural style, with long sentences and, complicated clauses. The error is just like a mistake in playing cards. Why do I revoke and play a diamond on a spade? I know perfectly well that I ought to follow suit. Because I am trying to think of so many things at once that I get muddled, and the obvious escapes my notice. This type of error is the great unsolved problem of foreign language teaching; but it fades away as mastery of the language becomes more complete. Perhaps time is

the only remedy for it. But in the mother-tongue it is easily remediable. There is no excuse for getting muddled in the mother-tongue Tell the children to write in short sentences · when they begin to feel muddled to *break the sentence*, and write two sentences instead of one. Confusion of this kind in the mother-tongue usually arises from trying to say two things at once. TWO GOOD RULES: (1) *Write as you speak.* (2) *A full stop in at least every third line.*

One point is to be added. We have assumed that the teacher is correcting the essays of the children carefully and conscientiously—not merely initialling them at the bottom, as is done in some schools. If you ask children to write and do not correct their errors, you are merely teaching them to write incorrectly. You lead them into temptation and leave them there. The objection will be made that the overworked Indian teacher has not time to correct all the exercises properly. Then let him set less exercises: for uncorrected work is useless—worse than useless, positively harmful. Actually the root cause is (apart from too large classes) usually that too much time is spent on original writing and too little on setting right and writing out again.

In short, if all work submitted to the teacher is the child's *best* work, and if all corrections made by the teacher are read, marked, learned and digested as they should be, corrections should not be a burden. If they are a burden to the teacher, he may very easily hand back that burden tenfold to the class, and they will soon learn to make his burden lighter.

These general remarks may be considered somewhat idealistic; and yet, given classes of a not unreasonable size, and a keen teacher, there is nothing impracticable in them. That they seem at all strange is due perhaps to the fact that our present teaching is so far from the ideal. But, where teachers are not keen, and where one man is expected to deal with fifty children crammed into one congested room, in such cases little can be done. All that the teacher can do is to carry out those collective parts of the work which are practicable, and for the rest of it, our best advice to him is—to do his best.

PRACTICAL

The course: three stages The course may be divided into three parts:—

Stage I: Basic Work (age 9-11). This part of the course aims at laying the necessary foundation in the elements. The child must here be taught to read correctly; he must also learn the essentials of grammar, and the habit of neatness and accuracy in writing.

Stage II: Preparatory Work (age 11-14). We here aim at speed in silent reading and the creation of a wider taste in reading. Poetry is begun, though no fine appreciation is yet to be expected. In writing we aim at producing correct and conscientious work in the communicative essay, and at laying a foundation of technique in the expressive type. (The real individual work in the expressive essay will be undertaken in the next stage.)

Stage III : Advanced Work. If our work in the two earlier stages has been successful, the boy should at this stage browse freely in the library with little prompting from the teachers, should read and appreciate poetry, developing some individuality of taste in this respect. He should also begin to discover something of the satisfaction of the literary artist, and write some compositions for his own pleasure and amusement.

Reading. We assume that the child has already mastered the elements of letter- and word-recognition. Our present problem is to lead him to fluent and expressive reading-aloud as a preparation for silent reading. The following lesson-form is suggested :—

Stage I

A 1 The teacher gives the meaning of difficult words in a section.
2. The teacher reads, dictating the pauses. (The boys mark the pauses in their books.)

B 1 A boy reads, facing the class The teacher asks intermittent questions to ensure that the class is following the substance and understanding. Errors of pronunciation are checked immediately *by the teacher.*
2 One or two other boys read the section, endeavouring to improve on the first rendering
3. A boy tells the substance of the section · the others supplement

C After two or three sections have been read thus, questions may be asked (for one word written answers) on the word-meanings or substance of the matter read.

As soon as the boys are able to read reasonably fluently, a change may occasionally be made in Section B above. Instead of having the section read aloud, the teacher will set questions, writing them on the blackboard, and set the class to discover the answers by reading the section silently. Or, as a later and more advanced stage he may tell the class to read the section silently, and then ask questions on it, the boys writing the answers. (Note.— The questions should be so designed as to require very brief one or two word answers)

Pronunciation. Defects which are common to most of the boys in the class may be dealt with by class drill, but ordinarily the defects are confined to a minority, and each child of this minority possesses different defects. Individual treatment is therefore necessary and should be given while the remainder are engaged in writing (e.g. during the Copy-writing lesson). Do not keep saying the word ; say it once, and let the boy repeat : at each attempt the teacher says ' Better ' or ' Worse '.

Library Work. The boys should be taken to the library once a week ; or, better, the teacher should collect from the library a number of books likely to be appreciated by the boys and a period may be devoted to exchanging books. A few questions should be asked on each book handed back, to ensure that it has really been read. While boys are changing their books the remainder should be engaged in silent reading. The teacher should maintain a record of the books taken by the boys, and give special attention to boys who are not doing enough private reading. The cause will usually be found to lie in failure to provide the type of book which interests the child : more rarely it is found to be a deficiency in silent-reading ability.

Poetry. At this stage children are interested in little beyond the rhyme and rhythm. The poem should be dealt with according to the lesson-form

given above, but the main emphasis of the lesson should be on greater perfection of reading aloud. The appreciation of a poem may often be greatly increased by having it read aloud by all simultaneously, the teacher giving the time by tapping on the table.

At all costs the sing-song style of recitation must be prevented. It is better to read a poem in too matter-of-fact a manner than to intone it as a meaningless incantation.

Writing.—Dictation. The passage used should be one which has previously been read.

A. 1. The teacher reads the passage aloud, the boys following in their books.
2. The teacher writes all difficult words on the blackboard. the boys write each of these five times. (These papers are now put away)

B. 1. The teacher dictates the passage slowly (Never repeat for this causes confusion and gets boys into the habit of not listening the first time.)
2. The teacher reads the whole passage over, giving exact value to the pauses for punctuation. The class fills in or checks the punctuation marks.

The work may be corrected by changing books, or may be corrected afterwards by the teacher. If the correction is made by changing books, it should be checked afterwards by the teacher. All errors should be written out correctly ten times

Composition. This consists in writing single sentences. The teacher asks the question, e g. ' What does glass do if it falls on a stone ? ' and the boys write the answer in a complete sentence, ' When glass falls on a stone, it breaks.' The teacher goes round and supervises, preventing errors.

The next stage is description of a picture. Before the children begin to write, the teacher should question the class on the picture, bringing out the various points which should be mentioned.

A story may be told and illustrated by simple drawings in squares on the blackboard. The boys then write the story, the pictures serving as a reminder of the substance. Later the mere plot of a story may be given to be written out and developed in the writing.

Some very simple letter-writing may be done, teaching the correct form of address and ending.

Grammar. This should arise from the written work. Some formal lessons on grammar may be needed, but the purpose of grammar-teaching must always be kept in view : grammar is taught, not for the sake of grammar but for the sake of accuracy in composition.

Reading. Drill should be given in silent reading, aiming at speed, provided that sufficient copies of the same book are available.[1]

Stage II Reading and making a tabulated précis is a valuable exercise.

Reading aloud should be confined to poetry and prose passages of a rhetorical nature. Boys should be encouraged to bring their own selections to class for reading aloud.

The co-operative reading of scenes from plays is very useful : the parts should be carefully rehearsed before the final reading.

Library work should be developed. Each child should keep his own record of reading and add against each book read some criticism or

[1] For the lesson-form see West, M., *Bilingualism*, 203.

appreciation: 'I liked this book because . . .' or, 'I did not like this book, because . . .'

Writing. The communicative type of essay may now be set. A high standard of accuracy and of neatness should be required.

The expressive essay may also be begun, but the main purpose at this stage is rather the development of technique than the production of original compositions. The course may begin by the writing of simple descriptions, e.g. 'From one hour before, to one hour after dawn in my home'; 'A market place, just before, and just after the market'; 'The railway station, just before, and just after the departure of the train'; 'The school playground just before, during, and after the interval'. Notice that each subject states both a place and a time, and more than one time is always given. The next stage is the conversation. The punctuation of speech should be carefully taught. All speech should be reported in the direct form. The scene and the movements of the characters must be indicated: people do not sit and talk like wooden dolls; they move about; their expression varies, their thoughts must also be told (people always think more than they say). Examples of subjects:—

'The village doctor and his patients.'
'A skinflint makes a purchase.'
'The headmaster interviews a naughty boy.'
'Two quarrelsome old men at a game of chess.'
'Two cultivators discuss the crops.'

These two types of writing supply the basis of the technique of the short story, for a short story is a mixture of description and conversation. The plot of a story may now be given. It should be divided up into scenes, and each scene should be written, corrected and rewritten in turn; the corrected fair copies are entered into the 'fair copy book'. In this way the complete story is gradually built up.

Speech. The 'Littleman Lecture' should form the basis of speech work.

A. A date is announced. The teacher (or a boy-secretary) collects subjects from the boys of the class. In the early stages it will be necessary for the teacher to help with suggestions.

[B. The boys prepare written drafts of their lectures. These are corrected by the teacher. *This step may be omitted.*]

C. On the day the teacher (or secretary) names a boy, who stands and delivers his lecture. The time-limit is five minutes. The teacher taps at any mistake of grammar or pronunciation, and the class corrects. After each lecture the other boys ask questions. A mark is also awarded to each lecture (on the vote of the class).

Grammar. This is incidental, arising out of errors made in the essays.

Reading. Reading aloud is confined to poetry and fine prose. To a very large extent the passages should be selected by the boys themselves. Much co-operative reading of plays should be done. Silent reading consists entirely in guided library work as described above.

Stage III

Writing. The more difficult subjects of the communicative type[1] should now be set, and much interest will arise from the discussion of these

[1] See Appendix to this chapter.

compositions in class. Emendments may be suggested and debated as in a formal council.

Expressive essay-work should now be entirely individual. The provocative subject may be set (see examples below), but those who prefer to do so, may select their own subject. The best compositions should be read aloud to the class by their authors, and criticized by the others. (This development of critical power is an important element in the course.)

Letter-writing. The finer art of letter writing should be practised towards the conclusion of the course. (Do not let it be thought that letter-writing is an easy accomplishment.)

Speech. Adolescent self-consciousness makes it difficult to do much at this stage. 'Littleman Lectures' may be continued, the lectures being made rather longer and more elaborate Debates are not advised, as the boys lack the experience to deal with most of the subjects which might otherwise lead to interesting discussions

APPENDIX

EXAMPLES OF ESSAY SUBJECTS 1. COMMUNICATIVE

Business Letters. 1 *Orders.* Collect some catalogues (or use a journal containing plenty of advertisements) The boys write orders for various articles, stating exact article required, size, shape, quality, price, how it is to be sent, how payment will be made, etc

2 *Calling for Tenders.* (In calling for a tender it is necessary to specify the exact amount, nature, and quality of the work required and the date for completion—otherwise the contractor may base his estimate on false assumptions)

(a) Specify a certain room in the school building, call for a tender for repairs

(b) An extra room—e g classroom, manual training room, drill shed, assembly hall, etc—is required: that the exact requirements, seating accommodation, special fittings, etc, but do not interfere with the architect's discretion

(c) A building for a primary school, club, dispensary

(d) Civil works—road, bridge, remetalling, etc.

In many cases these essays may usefully be prefaced by a little lecture on the elementary technique of the subject, e.g how a *pucca* road is made.

(e) Tenders for the supply of stationery to a school or office, refreshments for an entertainment.

(f) Tenders for motors to bring girls to school (Mention times, routes, numbers.)

3 *Agreements* (These should be in the form of a letter to a lawyer asking him to draw up an agreement. The wording should be beyond possibility of misunderstanding, but legal terminology must be avoided.)

Between lessee and houseowner; between publisher and author; between patentee and manufacturer, between employer and employee. Realistic details are to be supplied

4 *Applications for Vacancies* Use selected advertisements from the newspaper, qualifications may be supplied to taste, but should be of a reasonably probable nature

Tactful Letters. Such letters are, for the most part, complaints. Examples: Noisy children next door; the neighbour's gramophone or dog; pollution of a stream, waste matter thrown on to private land; goods of inferior quality or wrong specification supplied by a shop. Also letters of excuse for not attending some function (N.B. falsehoods are barred!)

Rules For admission of members to a club or institution which has certain specified objects and privileges, e g a school for native children in the Chittagong Hill Tracts; a Club for Government officers; a Musical Society; a Literary Club for young persons; a public garden which has to serve various conflicting interests—children, the general

public, purdah ladies, and sportsmen. Rules for the award of a special scholarship to commemorate . . . , and therefore limited to children with certain special qualifications Rules for the utilization of charitable funds, e.g Rs. . . . left for the encouragement of swimming in . . . District, of Boy Scouts; of literary talent, etc.

Directions. (This is an easy exercise and may be set in the junior grades) How to go from a place to a place (no map is to be supplied; give landmarks). How to use a Primus stove How to mend a bicycle tyre. How to grow

Orders 1 Orders for the posting of pickets during communal riots; with clear instructions as to the action to be taken in case of a disturbance

2. Draw the plan of an imaginary castle and issue orders for capturing it

3. You are in command of a body composed of one hundred men, ten armoured cars, and fifty cavalry. They are now at . . . (a place fifty miles distant). Issue orders for bringing them to . . . (the place where you are now). Specify route, time, method of travelling, where to camp on arrival. Issue necessary orders to shops in this place to supply food, petrol, fodder for the horses, straw, etc, all to be ready for the troops on arrival.

4. Draw up orders for a week-end Boy Scout Camp at . . . for . . . boys.

Tactful Speeches 1 The Minister in charge of Local Self-government replies to an address of welcome from an inefficient Municipality. The Chairman complains of lack of funds, but actually the rates are not being properly collected.

2. A speech at the annual meeting of a religious charitable institution which is too much given to dabbling in politics

3. A speech by the President of the Committee of a College, reviewing the year's work, the Principal is really too old for his work, yet is unwilling to retire.

4. A high Government official visits a place where there has recently been communal tension. The disturbances have been very promptly dealt with by the police, but they were perhaps a little too zealous On the other hand the public did not co-operate as they should have done—and hence the police were compelled to do more than would otherwise have been necessary. The Police expect to be congratulated The need for public co-operation is to be stressed Note that an ill-disposed section of the public will be eager to make use of any words said in criticism of the police.

5. Speech at a committee to consider the foundation of a Boys' Club: while the objects are apparently laudable, the proposal is a faulty one, with inadequate funds and the wrong people at the head of affairs. If you oppose the scheme you will be criticized for lack of sympathy with a laudable object

2. Expressive

Middle Stage The purpose at this stage is to teach technique. The plot of a story is given very briefly, the boys being required to divide it into scenes and expand it to full length. Examples: 1. A stolen document is hidden in a house. The householder denies all knowledge. Various searches fail to discover it The great detective arranges a false alarm of fire . . . (*Scene* 1. The detective's house. The client comes to consult him. *Scene* 2. An unsuccessful attempt to find the paper by searching for it *Scene* 3. Next day: the false alarm. *Scene* 4. Dénouement) For other subjects see West, *Original Composition in English.*

Advanced Stage Here the subject is merely suggestive and should interfere as little as possible with individual methods of treatment.

1. 'It was dawn when my boat grated upon the shore of an unknown island I got out and proceeded to explore.' *Go on.*

2. 'It was midnight: I sat up in bed: something had moved in the room.' Write a story with this sentence in it.

3. 'Place one of these pills in water, and drink it It has marvellous properties, it will make you . . .'

4. 'My condition was indeed desperate. I had lost my way, my strength was well nigh spent. The night was black as ink And then I saw a faint light in the distance.'

5. 'And the only clues were a Chinese postage stamp, a thick black hair, and a curiously shaped knife'

6. 'This machine', said the Professor, 'is capable of taking a human passenger safely to the moon or to any of the planets'

7. 'It is said to be haunted,' replied the villager, 'leastways I know this for sure, that no man has ever slept a night there and come out alive next morning, save one—and he was mad!'

8. An old couple, penniless, and in despair 'How long ago was it,' said the old man, 'that our little boy, Jack, went away?' 'Twenty years,' she replied

9. 'He had got the Code Book of the Society of the Black Hand' A 'pursuit' story telling how they attempt to recover it

10. A man, living here (in this very place) goes away on a six months' hunting trip, out of touch of news He returns to find the place absolutely deserted. Evidence shows that it was deserted suddenly—half finished meals in the houses, etc Describe the deserted place, invent an explanation and a dénouement

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CHAPTER 6

THE TEACHING OF ENGLISH

Before considering methods of teaching English in schools it is advisable to have a clear idea what the teacher's aims should be. Though the literary and cultural aims should not be lost sight of, the chief aim throughout the school must undoubtedly be linguistic.

Aims in teaching English

In teaching English as a language the teacher's aim may be analysed as being to enable his pupils —

1. To understand English when spoken ;
2. To speak English ;
3. To understand English when written or printed (i.e. to read) ;
4. To write English.

If the teacher keeps these aims before him, he has a means of checking his work by asking himself whether what he is doing is contributing towards the attainment of these aims or not. It may be noted that grammar and translation are not included among the aims They are only means to an end and are useful only in so far as they tend towards the attainment of these aims

The four aims are, of course, closely related to one another and work towards one aim assists work towards another. Reading assists writing and writing assists reading and the acquisition of a large vocabulary of spoken English is the quickest way of laying a sure foundation for the achievement of all aims.

The literary aim in schools may be defined as endeavouring to give pupils a taste for reading English and some appreciation of beauty of expression. In the middle school not much can be done in this direction beyond encouraging private reading and seeing that suitable books are provided in the class library. If a boy unwittingly takes out a book that is too difficult for him, he naturally becomes discouraged. In the high classes, besides encouraging private reading, some attempt may be made to guide appreciation. Pupils may be asked, for example, which lines of a poem they like best and the appropriateness of certain words and phrases may be noted.

A broader view of the aim of teaching a modern language is expressed in the following words in a recent report on the teaching of modern languages in England ' The study of modern languages should be the study of modern peoples in any and every aspect of their national life of which the languages are the instrument.' The ultimate aim is regarded as being ' to leave with the pupils a lively and sympathetic interest in the history, life and institutions of the foreign, though kindred, races whose language and literature they study.' The study of a modern people through the medium of their language must lead to a broadening of the general outlook of the students.

In India the value of learning English is both cultural and utilitarian. It is studied not only on account of its educational value as a modern language, but also on account of its practical use in India.

The direct method is not a method peculiar to the teaching of English in India, but is commonly and successfully employed in the teaching of foreign languages in Europe and elsewhere. Mr. Cloudesley Brereton has had long experience of modern language teaching in English schools and the following quotation from his recent book, *Modern Language Teaching* (University of London Press) will be of interest. 'I hold myself fortunate in one respect, inasmuch as my teaching experiences go back not only to the beginnings of the direct method, but even beyond. I am therefore able to judge and to compare methods and results with the few prehistoric survivors of the old régime and the more numerous band of critics who, when they wish to deprecate the new method, contrast it unfavourably with a sort of golden age in which pupils took to grammar as naturally as a duck to water, while the standard of examination is freely asserted to have been far higher than it is to-day. Unfortunately that golden age is largely mythical.'

The direct method

In the order of nature spoken language comes before written and it is easier to learn to speak than to learn to read a language. 'Learning to speak a language', says Mr. E. C. Kittson in his *Language Teaching* (Oxford Univ. Press), 'is always by far the shortest road to learning to read it and to write it.' The lamentable irregularity of English spelling also constitutes a special reason for postponing the teaching of reading until substantial progress has been made orally by pupils in acquiring a vocabulary

If the meaning of the bulk of the words in the primer has already been taught orally, learning to read involves only the association of words with symbols. If oral work has not preceded reading, then the beginner is confronted with the double difficulty of associating words with symbols and also meanings with words. It seems therefore best to postpone the perusal of printed books for the first two or three months. During this time rapid progress can be made orally by the direct method and the elements of writing and reading can be taught from the blackboard in connexion with these oral lessons.

The direct method of teaching a foreign language may be defined as a method in which a new word or expression is connected in the pupil's mind directly with what it stands for and not through the medium of the vernacular. The word *book*, for example, is connected directly with the thing, book, and not through any intermediate vernacular word

The technique of the direct method is simple and the following may be given as an example of the steps.—

1. The teacher gets a boy to stand
2. Model sentence spoken by the teacher, 'He is standing'.
3. Question by the teacher, 'What is he doing?'
4. Answer by pupils, 'He is standing'.

The answer by the pupils may be given either individually or collectively. For further information about the technique of this method reference may be made to Stokes, *Reformed Method of Teaching English* (Longmans), or similar books.

The question now arises, what is to be taught by this method? Choice will naturally be restricted to those words that represent objects and actions, etc., that are familiar to the pupils. The English language consists of a large

number of words which may be classified under eight heads or parts of speech, nouns, adjectives, verbs, adverbs, pronouns, prepositions, conjunctions, and interjections and the commonest words in each of these classes should be taught. Objects in the classroom and actions performed in the classroom provide material for teaching a large number of words, e g. *door, glass, leg, coat, go, shut, jump, big, white, he, quickly, here, on, near, and.* Occasionally the class may be taken out of doors and a new store of material becomes available, e.g. *leaves, clouds, green, shine.* Pictures in the classroom provide material and the teacher may bring objects into the classroom, such as a lock and key, a piece of string, a box of matches and a lamp. It will be found useful also for the teacher to look up the primer that will be placed in the hands of the boys, and to teach orally the meaning of as many as possible of the words found there. This will facilitate the learning of reading when the time comes.

To practise the forming of sentences both teacher and pupils should always speak in complete sentences. Now sentences are of three kinds, affirmative, negative and interrogative. If the teacher always asks questions and the pupils always give the answers, the pupils do not get the necessary practice in the use of the interrogative form. Practice in the use of interrogative sentences may take the form of a game. 'A' asks any boy 'B' a question; 'B' having answered the question asks 'C' a question and so on. Incidentally this serves as a kind of revision of work done. The class may also be divided into groups, the pupils in each group asking one another questions and giving answers

Adequate drill in the use of new words is essential, but, in addition to this, systematic revision of words already learnt is necessary. It is no use the teacher going on teaching four or more new words every lesson unless he ensures that the words already learnt are remembered. A portion of each period should be devoted to revision and occasionally whole periods may be devoted to the same purpose.

It is perhaps advisable here to remove a mistaken impression that in direct method lessons the vernacular is never to be used. It should be used, whenever necessary, to explain what is to be done, or to make clear any doubtful points. As a general principle, however, English should be spoken and heard as much as possible during the period.

The advantages of the direct method may be summarized as follows: First, it is the most interesting method to the pupils, and, if the pupils are interested, the teacher's battle is half won. This is largely because it calls for alertness and physical activity on the part of the pupils and not a mere poring over books. Secondly, it is the quickest way of getting started. In a few months over 500 of the commonest English words can be learnt and used in sentences, and this is a sound foundation for further work. Thirdly, speaking English and understanding English are forms of skill that can be acquired only by practice. The direct method provides the maximum amount of practice in these forms of skill, as English is spoken and heard practically throughout the lesson.

The direct method has of course its limitations. By this method excellent progress can be made at the outset towards the attainment of two of the aims of the teacher, namely, enabling pupils to speak English and to understand

English when spoken It is obvious, however, that words denoting abstract ideas such as truth, honesty, love, hate, cannot be taught by this method The direct method does not teach pupils to read and write, but it provides an excellent basis for the teaching of reading and writing by furnishing pupils with a large vocabulary and ability to understand and use English sentences. Reading from the blackboard and copying from the blackboard can be commenced in the direct method lessons, as will be indicated later

For the benefit of those teachers who feel the need of guidance a suggestive list is given below of 500 common words that can be taught by the direct method. Some of these can be taught in the classroom, others in the playground and others by means of pictures or objects brought before the class. To the words in the list may be added the different parts of the verb *to be* and of other verbs in the list, the numerals, the personal pronouns, the time of day (which can conveniently be taught by the aid of a clock dial made of wood or cardboard), the days of the week and the months. Opinions may, of course, differ as to the words that should be included in the list and teachers should alter it to suit local circumstances. It is not necessary or desirable that exactly the same words should be taught in all schools as the first 500 If, for example, a school is situated on a river bank words like *river, boat, swim, fisherman* may be included.

a above after again all and an answer arm ask at away

back bad bag ball bat be beat beautiful bed before behind bell belong below belt bend beside best better between bicycle big bird bite black blot blow blue board body book boot both bottle bottom box boy branch bread breadth break breast brick bright bring broad brother brow brown brush bud build burn button buy by

call can candle cap car card carry carpet cat catch cattle chair chalk change cheek child chin circle city class clean clear cling clock close cloth clothes cloud coat cold collar colour come contain cork corner cotton cover count cow crack crow crush cup cut

damp day deep desk dinner dirt ditch divide do dog door double down draw dress drink drop dry dust

each ear earth east eat edge elephant empty end enter envelope every eye face fall far fast fasten fat fence fetch few fill finger firm fish fix floor flower fold follow food foot football forehead from front fruit full

game garden gardener gate get give glass go goat gold good grasp grass green ground

hair half hand handkerchief handle hang hard hat have head hear heat heel height here high hill hit hold hook horse hot hour house

in inch ink into iron it its

join jump

keep key kick knee knife knock knot

lamp lantern large laugh lay lead leaf lean learn leather leave left leg length letter lid lie lift line lip little live long look loose low lump

make man many map mark match metal milk mirror mix money monkey mountain mouth move much mud

nail name narrow near neck new newspaper next night no north nose not nothing now number

o'clock of oil old on open opposite our out outside over
page pair paper part pay pen pencil people pick picture piece pin place plant play plenty pocket point pour press pretty price print pull pure push put
quarter quick
rag rain raise rat reach read ready receive red remove reply return right ring rise road rock roll roof room root rope rose rough round run
saddle salt same sand say scatter school scrape screw scratch seat see seed sell several sew shade shadow shake shallow shape sharp sheep shine ship shirt shoe short shoulder show shut side silver sit skin sky slide slow small smell smoke snake soap soft some something south speak spot spread square stamp stand stem step stick stone stoop stop street string strong sugar sun sweet
table talk tall taste teach teacher tear telegram tell that the then there these thick thin thing this those thread through throw thumb tie tight tin tip to to-day together to-morrow tooth top towards town train tree trunk turn
umbrella under up upon
very village voice
walk wall warm wash watch water way wear well west wet what wheel where which white while who whose wide wind window wipe wire with woman wood wool word wrap write
yellow yes yesterday

Reading

The teaching of reading can best be begun in conjunction with direct method lessons. The teacher writes on the blackboard two or three words that have been learnt orally, e.g. *pen, book, table.* He points to each word and pronounces it and finally gets pupils to read the words from the blackboard. Words are then analysed into their component parts, the letters, and pupils begin to grasp the spelling. After some practice with words, sentences learnt orally may be written on the blackboard and pupils made to read them. Sometimes selected pupils may, instead of the teacher, write the words and sentences learnt on the blackboard. In this way the teaching of writing will be correlated with the teaching of reading and the oral work.

In writing on the blackboard it is advisable for the teacher to use script writing. The traditional manuscript letters vary a good deal from the printed forms and learning to read the manuscript form does not always assist in learning to read the printed forms. If at this stage script writing is used for learning to write, the work of learning to read is materially assisted. Script is a form of writing in which the letters used are similar to those found in printed books, but without any superfluous serifs. The complicated a is replaced by *a* and g by *g*. All the unnecessary loops and flourishes of the traditional cursive handwriting are abandoned: for example *f* and *k* are replaced by *f* and *k*.

After considerable practice in reading from the blackboard pupils will be introduced to a printed book of very easy passages containing simple sentences and simple words If they have already learnt the meanings of most of these words by the direct method, the task of reading will be much simplified. The actual plan of the lesson may be somewhat as follows :

1. Preliminary discussion of the subject matter of the lesson, in which some of the difficult words of the lesson may be introduced. If there is a picture, questions may be asked on it.
2. Model reading by the teacher, the pupils following in their books.
3. Explanation of difficulties, and drill in the pronounciation of difficult words.
4. Collective reading by the class after the teacher.
5. Reading by individual pupils
6. Oral work based on the lesson.

In higher classes, when the lessons become longer and the initial difficulties of reading have been overcome, some such plan as the following may be adopted.

1. Preliminary discussion of the subject matter. If the lesson is a continuation of the previous day's lesson, some revision questions on the previous day's lesson may serve as a preparation for the new lesson. If there is a picture to illustrate the lesson, it may form a suitable basis for the preliminary conversation.
2. Treatment of each paragraph or stanza as follows.
 (a) Silent reading by pupils or reading aloud by the teacher or by a selected pupil.
 (b) Explanation of difficulties. Grammatical points.
 (c) Reading by individual pupils.
 (d) Oral work based on paragraph or stanza.
3. Oral work on the whole lesson.

Oral work includes questions and answers, summaries, framing sentences using particular words and phrases, reshaping sentences using a different tense, or indirect instead of direct narration and exercises in grammatical usages.

Whether it is better that the paragraph should be read aloud or silently in the first place is a matter of opinion. Probably it is best sometimes to adopt one method and sometimes another. Reading aloud gives the pupils more practice in hearing English, while silent reading trains them in rapidly grasping the meaning of the printed page. Silent reading should be really silent and the classroom should not be filled with an audible buzz as each pupil reads aloud to himself. After silent reading the pupils may be asked what their difficulties are and a few questions may be put to ascertain whether they have really understood the meaning, or whether further explanation is necessary.

It must be realized that no stereotyped plan will fit all lessons. The plan of the lesson must vary according to the nature of the subject matter, the ability of the class and the personality of the teacher For each lesson the teacher should think out a definite plan.

The explanation of difficulties in the reading lesson will put the teacher's skill to a severe test. When possible the meaning of new words and phrases should be demonstrated according to the principles of the direct method by means of concrete objects or by actions, or by sketches on the blackboard or pictures. When this is not possible the new word or phrase may be used by the teacher in some typical sentences. Take the word *opposite*. The teacher may say 'Black is the opposite of white. Night is the opposite of day'

Or take the word *kind*. The teacher may say 'Mothers are kind to their children. A kind man gives money to the poor.' As a test of their comprehension pupils may be asked to give the meaning in the vernacular. Simple English equivalents may sometimes be given but difficult definitions taken from the dictionary should be avoided. If English explanations fail, recourse must be had to the vernacular. To impress useful words and phrases on the minds of pupils it is best, perhaps, to write on the blackboard and let the pupils take down in their notebooks typical sentences in which the new word or expression to be learnt is correctly used.

In the higher classes every pupil should possess a dictionary (the Concise Oxford Dictionary is a good one) and should be made to look up all new words in each day's lesson beforehand. Failure to know the meaning of a word should be followed by a fixed punishment, such as writing out the word and its meaning a hundred times. The individual effort involved in trying to understand the meaning of a passage with the aid of a dictionary is of greater value in learning a language than passively listening to a teacher's explanation in class.

In reading aloud the chief points that require attention both by teacher and pupils are the following. (1) Articulation. Words and syllables must be clearly uttered and not hurried over. Special attention should be paid to the enunciation of the final consonants of words (2) Pronunciation. A thorough grounding in English Phonetics is valuable for teachers and, though a knowledge of phonetic symbols may not be necessary for pupils, a little phonetic drill in the lower classes is helpful. (3) Punctuation. Suitable pauses should be made where there are breaks in the sense. An old rule was that the reader should pause sufficiently long at a comma to count *one*, at a semicolon to count *one, two*, at a colon to count *one, two, three*, and at a full stop to count *one, two, three, four*. It is not necessary to follow such a rule of thumb, but it is useful to bear it in mind as both teachers and pupils are rather liable to hurry on without making sufficiently long pauses. (5) Loudness. The voice should be sufficiently loud to be heard without difficulty by all in the class, but not louder.

Besides textbooks which are intended for close study, books intended for more rapid reading should be read in the higher classes. The object of this rapid reading is to train pupils in quick comprehension of English passages and to serve as a transition step between the study of the textbook under the guidance of the teacher and reading without assistance. The object being different, the method of handling the rapid reading lesson must also be different. The principle is that pupils should proceed as fast as possible consistently with a proper understanding of the passage The preliminary step may be cut down to two or three questions, the presentation step to a single reading and a brief explanation of difficulties, and the application step to a few questions to test whether the pupils have understood the meaning. If the matter is easy, pupils may sometimes be asked to read a chapter or so at home and questions may be asked on the subject matter in class and pupils asked to give short summaries

About the nature of the contents of the readers there are two schools of thought. One believes it important that pupils should early become accustomed to an English atmosphere. This, they think, will enable them to

appreciate properly English books. They favour, therefore, stories dealing with English ways of living, English fairy stories, stories about Christmas, snow and so on. The other school holds that, as the bulk of the pupils will not leave India, it is best that the stories should be about familiar things, about Rama and Sita, about elephants and the jungle and so on It is wisest perhaps to steer a middle course and to avoid extremes The main point is that the stories should be interesting to the pupils.

The library

Besides the prescribed textbooks and rapid reading books pupils should be encouraged to read other suitable books out of school. A few fortunate pupils may have access to suitable books in their homes, but the majority will be dependent on the school library. It is essential, therefore, that every school should have a well-stocked library of suitable books

Now it is obvious that for pupils in different stages of proficiency in English there should be books of different degrees of difficulty. Even apart from the question of proficiency in English younger pupils and older pupils require different types of books. Nothing is more likely to discourage a pupil and to give him a distaste for reading than to be given a book to read that is too difficult, too long, or otherwise unattractive. It is desirable therefore, that the school library should be divided into sections, each section containing books suitable for a particular class.

Books for beginners should be attractive in appearance, well printed and well illustrated and should contain simple and interesting stories. A large number of such books are now available at a low cost and some publishers grade their books, according to the degree of difficulty, as suitable for class 1, class 2, and so on. There is thus no difficulty, other than financial, in stocking the school library with suitable books.

Many schools adopt the excellent plan of having, in addition to the main school library, class libraries located in the different classrooms under the charge of class-teachers. If this is done, the class-teacher in issuing books can note how much reading each pupil is doing, can encourage the keen pupils and stimulate the slackers. By occasional questions he can test whether the pupils are reading intelligently. If a book is particularly well liked by the pupils, a number of copies of it may be put in the class library, so that several pupils can read it at the same time. It is perhaps better to have in the class library five copies of each of twelve really suitable books than sixty different books, many of which are not really suitable.

In the library, or in a separate reading room, may be placed some good English newspapers and magazines and the pupils should be encouraged to read these at their leisure. Illustrated papers, such as *The Times of India Illustrated Weekly*, naturally attract pupils, and should therefore be provided for them to read. In some schools cuttings from newspapers and illustrations of important current events are placed on a special board in some prominent place for pupils to see. Much English is learnt incidentally from the casual perusal of newspapers and magazines.

A section of the general library should be devoted to books especially intended for the use of the teachers. These should include books on pedagogy as well as books for general reading. The library should also contain a large dictionary, a large atlas and other reference books.

Together with reading, writing may be commenced in the direct method lessons, the teacher writing on the blackboard words and sentences learnt orally and the pupils copying them in exercise books with double lines. One advantage of teaching writing from the blackboard is that the pupils see the actual process of writing and are able to imitate it: in copy-books they do not see the process, but only the finished product. Another advantage is that writing is thus closely correlated with oral and reading work. After writing from the blackboard has been learnt, transcription from the reader may be practised.

Writing

Reference to the desirability of using script writing in the initial stages has already been made above in the section on Reading. The advantages of script writing may be summarized as follows. First, script writing is neat and legible; secondly, it contains only the simplest, skeleton forms of letters, all loops and flourishes being avoided, so that difficulty and fatigue are reduced to a minimum; thirdly, confusion between the printed and manuscript forms of letters is avoided, so that writing helps reading and reading helps writing. The transition from script writing to ordinary cursive writing presents no difficulty.

The question whether copy-books should be used is debatable. Some copy-books begin with meaningless strokes and curves which are quite unnecessary for pupils who have already acquired some control over their pens in learning to write the vernacular. Others contain words and sentences that bear no relation to those learnt in oral and reading lessons. Others emphasize the loops and flourishes of the traditional cursive handwriting which, as has been indicated above, are unnecessary and undesirable for beginners. There is also a danger, when copy-books are used, that the efforts of the teacher will be directed towards ensuring good handwriting in copy-books only. It is better to omit copy writing and to insist on all written work being good than to insist on good copy writing and to neglect handwriting in other written work. It must be admitted, however, that some modern series of copy-books are quite useful.

The period devoted to handwriting practice should not be too long, as pupils quickly get tired. The allotment of one or two periods per week to handwriting practice is not at all desirable. Five or ten minutes at a time is long enough. Some at least of the practice should be done in class, so that the teacher may see that correct habits are being formed.

Correct posture is of importance. In sitting, the pupil's feet should be flat on the floor, the thighs parallel to the ground and the back supported. The nearer edge of the desk should slightly overlap the edge of the chair or bench so that the pupil is not obliged to lean forward. The pupil should sit comfortably erect. Bending forward cramps the stomach and lungs and twisting the body sideways tends to curvature of the spine.

Movement in writing is effected by the muscles of the fingers and of the arms Good handwriting can be achieved by the use of the fingers only, but the finger muscles are not so strong as the arm muscles and entire reliance on them is fatiguing. Some use of the arm muscles, especially in the up and down strokes, will save fatigue.

Some authorities contend that sloping writing is not so hygienic as upright writing because it tends to twisting the body sideways and to tilting the

paper so that the line of vision is oblique instead of straight in front. Certainly, if sloping writing is used, twisting of the body must be avoided and the paper should not be excessively tilted.

Aims in handwriting should be (1) legibility, (2) beauty, (3) speed. In correcting handwriting the teacher should pay attention to the following points.

1. Uniformity of alignment. The bottoms of letters should touch the same straight line (real or imaginary) and the tops should touch a line parallel to this. The parts of some letters that go above or below the lines as in *t* or *y* must, of course, be excepted.

2. Uniformity of slant. If the writing is upright, all the letters should be upright, if sloping, all the letters should have the same slopes.

3. Letter formation. All parts of letters should be correctly formed.

4. Evenness of stroke The writing should not be too thick or too thin.

5. Spacing. Letters should not be too crowded together, nor should words. Conversely they should not be too far apart.

6. Speed. Speed in writing is of great value, provided that it can be effected without sacrificing legibility.

A word of warning may be inserted here about the menace to good handwriting of rough notebooks. Where they are allowed, pupils get into a habit of hurried scribbling which adversely affects their handwriting. When notes have to be taken down, it is best that they should be written at once in fair notebooks. Incidentally this saves a good deal of time. If a pupil has to write down some preliminary work, as in writing out headings for an essay, he may do this on the left hand page of his exercise book, reserving the right hand pages for the work in its final form.

In most public examinations marks are, quite rightly, deducted for bad handwriting. This is a practice which should be adopted in all class examinations also. Some teachers prefer to allot a definite number of marks for handwriting instead of deducting marks for bad handwriting from the total number of marks gained. This is a plan which is perhaps most effective in the lower classes.

Spelling

English spelling unfortunately presents serious difficulties to the learner on account of its irregularities. The spelling became standardized long ago, but the pronunciation of many words gradually changed. So it has come about that the spelling of the words does not correspond with the pronunciation. Many people would welcome the simplification of English spelling, but the difficulties in the way of changing the present system are very great. It is unavoidable, therefore, in present circumstances that the aspirant to a knowledge of English should somehow learn the traditional spelling.

There are two methods of teaching spelling, the incidental method and the drill method. In the incidental method no special time is allotted to drill in spelling and no lists of words are given for memorizing. The teacher relies on drawing the attention of the pupils to the correct spelling of words in the reading and other lessons. The advantages of the incidental method are that it is correlated with the reading, writing and other lessons and that it avoids the drudgery of the drill method.

The incidental method is good as far as it goes, but those that rely on it

may find that it does not go far enough. It requires generally to be supplemented by some form of drill. The object of the drill is to focus the attention of the pupils on the right association of letters and to provide sufficient repetition to enable them to fix the association firmly in their minds.

Spelling associations, or spelling memories, may be :—

1. Visual, as in seeing a word spelt on a printed page ;
2. Auditory, as in hearing the word spelt aloud ,
3 Motor, as in movements made in writing a word ;
4. Motor, as in movements made in spelling a word aloud.

Of these it can be demonstrated by experiments that the visual association is the strongest and it must be remembered that accuracy in spelling is demanded chiefly in writing. The other associations should not of course be neglected. It seems advisable, therefore, that in teaching the spelling of a word the teacher should write the word on the blackboard and focus the attention of the pupils visually on the association of the letters, that the pupils should write the word, that the teacher should spell the word aloud and that the pupils should also spell the word aloud. For testing whether the pupils have learnt the spelling of a word the ordinary question and answer may be employed.

To enliven the drudgery of learning spelling various spelling games have been invented, the simplest of which consists of dividing the class into two groups, each under its own captain Each group in turn propounds a word for a pupil in the opposite group to spell Marks are awarded for correct answers The teacher is the umpire and may veto words the spelling of which the class is not expected to know. The groups should remain the same for some time. The value of such games lies in their reliance on the team spirit which will stimulate pupils to pay special attention to the spelling of words that they meet in order that they may gain marks for their groups.

It will be of some assistance if the teacher brings together words of similar constitution, for example,

say, pay, pray, play, lay, stay ;
die, lie, tie , cry, dry, try ;
collection, perfection, construction, direction ;
confession, expression, possession, oppression ;

The spelling of words of similar pronunciation but different meanings may also be contrasted, when occasion offers, in sentences, e.g.

their, there ; hear, here ; son, sun ; write, right ;
see, sea ; tail, tale ; to, too, two.

It is desirable that the teacher should keep a list of words that are commonly misspelt by the pupils. He should write the correct spelling of these on the blackboard and the pupils should copy them down in their notebooks and memorize them.[1]

[1] To eliminate the difficulties caused by English spelling and to promote the use of English as a world language, Prof. Zachrisson of Uppsala University, Sweden, has recently invented an easy system of spelling English to which he has given the name, Anglic. This has the support of spelling reform associations in England and America. If generally adopted, it would considerably lighten the labour of learning English both for foreigners and for English-speaking schoolboys Zachrisson, *Anglic : a new English Spelling* (1s. 2d) and other literature on the subject may be obtained from Anglic Fund, Uppsala, Sweden.

Written composition

This progresses in difficulty from writing a single sentence to writing a paragraph containing a number of sentences and then to writing a passage containing a number of paragraphs Practice in sentence construction may consist of completing sentences such as 'The bird sat on a' or in writing sentences about a boy and a book and similar topics. Practice in writing single paragraphs may include the reproduction of simple stories told by the teacher, and the description of familiar things such as the classroom Some oral work may precede the actual writing. Practice in writing passages containing several paragraphs may comprise the reproduction of stories, the expansion of stories from outlines, letter-writing, the description of familiar things and the narration of stories.

In writing essays two things have to be considered, matter and form. As regards matter, it is no use asking pupils to write about things they do not know. Topics should be chosen that are familiar to the pupils in their everyday life, such as games, a railway station, animals, or about which they have read in history or geography, such as lives of great men and descriptions of natural features like deserts or volcanoes or countries like Japan. If the subject is difficult, the teacher may first discuss the subject orally with the class and perhaps write an outline on the blackboard. As the pupils advance, however, less and less help should be given by the teacher and the work should become more constructive and less reproductive. Sometimes the pupils may be asked to suggest the topics on which they would like to write If suitable, they may be allowed to write on these topics. This will encourage originality.

As regards form, pupils should be trained to express themselves simply and clearly. Long and complicated sentences, at any rate in the early stages, should be avoided. Points to which attention may be directed are the orderly arrangement of the subject matter in paragraphs, the proper construction of sentences, spelling, punctuation, capitals, grammatical forms, the choice of words, idioms. Of these perhaps the most important is the proper construction of the sentence. A sentence imperfectly constructed, e.g. a sentence without a finite verb, or a sentence containing a finite verb without a subject, should be regarded as a heinous crime.

The labour of correction may be lightened by the use of symbols, such as R for rewrite, C for capital letter, O for a spelling mistake, and so on. Carelessly written essays should not be corrected, but returned to the pupils to be rewritten. Words spelt wrongly and such parts of the essay as may be marked for rewriting by the teacher should be rewritten correctly. A book of common errors may be kept and pupils drilled in the correct forms, so that it may not be necessary to correct the same mistake repeatedly. Common errors may be classified under the heads, errors of spelling, errors of grammar, and errors of idiom. Some kind of marks should be given to stimulate the pupils and enable them to gauge their own progress. If class marks are not registered, essays may be marked A, B, C, D, according to their quality.

A question to be considered is whether essays should be done in class or at home. In class there is often not time enough for the pupils to think out the proper arrangement of the subject matter and to write it out. At home it is possible that the pupil may get some assistance from a book of essays or from some kindhearted relative. Some essays may be done in class and

some at home, but perhaps the best plan is to set a subject for the pupils to think out at home and to write in class.

A good deal of grammar teaching can be correlated with composition, especially in the lower classes. Sentences in the active voice may be rewritten in the passive voice, tenses may be changed and direct speech rewritten in indirect speech. Pupils may also be asked to write sentences containing some particular kind of clause, such as an adverbial clause of time.

Imitation plays an important part in essay writing and pupils will unconsciously base what they write on what they have read. Extensive reading of well-written books is therefore clearly desirable and it is desirable also for teachers to direct the conscious attention of pupils to any specially suitable passages that may be met with in the reading lessons in order that they may serve as models. The style, the structure of the sentences, the choice of words and the idioms in these passages may be studied. Learning by heart has gone somewhat out of fashion, but there is no doubt that memorizing some good English passages materially assists writing good English.

The amount of English composition that should be done is limited only by the amount that the teacher can correct, and it may be laid down as a general rule that all pupils should write at least one piece of composition per week. Writing English is an art and an art can be acquired only by practice. The more practice pupils get therefore in writing English under proper guidance, the more rapid will be their progress.

Grammar

The science of grammar is based on the usage of the best writers and speakers and use is its only sanction. For example, the grammatical rule that the verb agrees with its subject in number is based on the fact that the best writers and speakers use a verb in the singular with a singular subject, and a verb in the plural form with a plural subject. If the best writers and speakers were to change their custom and use the same form of the verb for both singular and plural subjects, the grammatical rule would be altered accordingly Language comes first and grammar afterwards.

There is a good deal of uncertainty among teachers of English about the amount of grammar that should be taught. In teaching English the teacher's aim has been analysed above as being to enable his pupils

1. To understand English when spoken;
2. To speak English;
3. To read English;
4. To write English

It follows from the above analysis of the teacher's aim that any part of grammar that assists the teacher in attaining his aim should be taught and any part of grammar that does not assist in this should be discarded. Grammar is only useful in so far as it helps pupils to speak, write, read and understand English

A good deal of the traditional grammar may consequently be abandoned as useless. In particular a large number of technical terms borrowed from Latin and Greek, with which many English Grammars are cumbered may be discarded, as for example *ablative case, gerundial infinitive.* Even the distinction between the gerund and the verbal noun is unnecessary and the

term *gerund* can be eliminated. The subjunctive mood is now practically dead in English, except for a few relics such as *God save the king, I wish I were a king.* Teaching pupils about a subjunctive mood which exists only in the imagination of grammarians is a sheer waste of time

What, then, are these parts of grammar which can usefully be taught? The essentials of grammar are (1) the different parts of speech and their functions; and (2) the structure of the sentence. All speech and writing consists of words and sentences and a systematic study of these will be found helpful. Apart from these essentials, useful grammar teaching is confined chiefly to the study of idiomatic usages such as the sequence of tenses, indirect speech and the use of particular prepositions with particular words.

The parts of speech are the eight divisions into which all the thousands of words of the English language can be classified. If a word is the name of a person or thing, it is classified as a noun; if it denotes a quality, it is classified as an adjective and so on. Some parts of speech, as interjections and prepositions, need not be subdivided further, but others have subdivisions that require further study. Nouns, for example, may be divided into common and proper nouns, and verbs have different tenses to denote different times It may be noted that the different parts of speech are classified solely by the functions they perform in the sentence. A word may have different functions in different sentences. Ordinarily, for example, the word *school* performs the function of a noun, but in the phrase *the school clock* it performs the function of, and is, an adjective.

The structure of the simple sentence does not present any great difficulty. In their reading lessons pupils may be asked to pick out in selected sentences the subject and the predicate, or the subject, verb and object. The structure of the complex sentence presents greater difficulty and the pupils should be made thoroughly to understand the nature of noun, adjective and adverb clauses, the difference between main and subordinate clauses, and the function of each clause in a complex sentence. To enable pupils to grasp thoroughly the structure of complex sentences a good deal of practice in clause analysis is necessary. In this clause analysis pupils should be able to pick out the main clause and the various subordinate clauses, state what kind of clause each subordinate clause is and its function in the sentence. Once the structure of the complex sentence is thoroughly understood, pupils will be able to frame these sentences correctly themselves.

It should be understood that by clause analysis is not meant the complete analysis which is sometimes shown in grammars in a tabular form with headings for subject, enlargement of subject, verb, object, enlargement of object and adverbial adjuncts This, at any rate in complex sentences, is too tedious an exercise and takes up too much time. If pupils understand the structure of the simple sentence properly, it is sufficient for them to be able to analyse complex sentences into clauses.

A great deal of grammar teaching, especially in the lower classes, can be done in connexion with the reading and composition lessons. For example, at the end of a reading lesson the pupils may be asked to pick out the words that are the names of persons or things and may be told that these are called nouns. For composition they may be asked to rewrite in the past tense sentences written in the present tense, to rewrite in indirect speech sentences

written in direct speech and so on. Any important grammatical points met with in the reading may be noted and occasionally sentences in the reader may be analysed.

In the early stages it is possible to base a good deal of English grammar teaching on vernacular grammar. If the teacher of English is not also the teacher of the vernacular, it is necessary for him to keep in touch with what has already been learnt by the class in vernacular grammar. It is a waste of time to teach laboriously some point in English grammar as though it were entirely new, when a reference to vernacular grammar might make the point perfectly clear to the class. It is important, therefore, not only for vernacular teaching, but also for English teaching that vernacular grammar should be taught on sound lines.

In grammar lessons it is best to use the inductive method, the definition or rule coming last after adequate consideration of numerous examples. After the rule or definition has been established and sufficiently emphasized by being written on the blackboard and repeated, pupils may be asked to frame sentences of their own as examples of the definition or rule This helps to fix the rule or definition in their minds Thus the method of teaching is inductive until the generalization has been established and is then deductive, examples being based on the generalization. The following plan of a lesson on the noun infinitive, adapted from the writer's *Exercises in English Grammar and Idiom* (Oxford Univ. Press) may serve as an example of the method suggested.

The Infinitive used as a Noun

Step 1. Presentation of examples.

Examine the following sentences :—

To help others is our duty.
To succeed is not easy
The quickest way is *to go* by train.
We like *to play* hockey
We hope *to win.*
Nothing is left for us except *to die*

Step 2. Inference and generalization.

Each of the above sentences contains an infinitive. What work does the infinitive do in each of these sentences ?

The infinitive does the work of a noun.

Parse the infinitive in each of the above sentences. It will be found from the parsing that in two sentences the infinitive is the subject of a verb, in one sentence it is a complement of a verb, in two sentences it is the object of a verb and in one sentence it is the object of a preposition.

Generalization · The infinitive is sometimes used as a noun. It may be the subject, object or complement of a verb or the object of a preposition.

Step 3 Application. Write six sentences containing noun clauses.

For beginning the teaching of English the translation method is now obsolete and has been replaced by the direct method. No one who has carefully compared the two methods can have failed to be struck by the

greater alertness and interest displayed by pupils taught by the direct method and by their more rapid comprehension of English and greater fluency of expression. The only question that need be considered is how far, if at all, translation should be practised after the initial stage.

Translation

In the lower classes there seems little doubt that the practice of translation conflicts with the principles of the direct method and should be sparingly employed. The teacher may, of course, resort to the vernacular to explain a difficult word met with in the reader or elsewhere that cannot conveniently be explained by the direct method or by using the word in typical English sentences.

The vernacular may also be made the basis of exercises in English composition by making the pupils study a vernacular passage for a limited time and then shut their books and write out the substance of the passage in English. Another useful practice is to tell a story in the vernacular and to make the pupils write out the substance in English. In this way the danger is minimized of pupils getting into the habit of translating by merely substituting one word for another.

For higher classes there is some difference of opinion about the value of translation. The chief objections to relying too much on translation are the following. First, the majority of pupils do not use English out of school, except for home work, so it is essential that they should have as much practice as possible in speaking, hearing, writing, and reading English, at any rate during the English periods. In translation much time is taken up in comprehending the vernacular or in expressing ideas in the vernacular and in writing in the vernacular. However admirable this may be from the point of view of vernacular teaching, it is time wasted so far as teaching English is concerned.

Secondly, translation is very liable to degenerate into purely literal translation and to inculcate the use of wrong English expressions. Words in one language have not always exact counterparts in another language and corresponding idioms cannot always be found. Much ludicrous English is the result of learning English by translation.

Thirdly, if fluency of expression in English is desired, it is necessary that pupils should learn to express themselves directly in English without having first to formulate their thoughts in the vernacular and then mentally translate them into English. The constant practice of translation must tend to foster mental translation and obstruct free expression in English.

Translation practice is of two kinds, from English into the vernacular and from the vernacular into English. The former provides practice in comprehending English, but a good deal of time is necessarily occupied in expression in the vernacular. It is not therefore of great value in teaching English except as a test of the pupils' comprehension of English.

Translation from the vernacular into English is of rather more value because, unless time is wasted by dictating the vernacular passage or writing it on the blackboard, the comprehension of the vernacular passage need not occupy much time and a good deal of practice in English expression is provided. If care is taken to avoid too literal translation, and English and vernacular idioms are compared and contrasted, useful work can be done.

Unseen passages

It is desirable to practise pupils in the higher classes from time to time in the rapid comprehension of English passages previously unseen by them. The chief difficulty in this exercise lies in placing the unseen passage before the pupils. If the pupils are required to purchase books of unseen passages, the passages will not be unseen; if the teacher writes the passage on the blackboard or dictates it, a great deal of time is wasted. One solution is for the teacher to duplicate the passage by means of a cyclostyle. After use the cyclostyled passages may be collected and stored for future need. In this way the teacher will in time acquire a large number of sets of suitable passages. If books containing suitable selections are used, another solution is for the teacher to keep a sufficient number of books and to distribute them at the time of the exercise. It is essential that the passages selected should be interesting, written in modern English and of the right degree of difficulty for the class.

Exercises on unseen passages consist generally of explanation of difficult sentences and phrases, grammatical exercises and summaries. Pupils should be trained first to read the passage through carefully once or twice to get a general understanding of the passage and then to make intelligent guesses at the meaning of any words or phrases that are new to them A general understanding of the whole passage facilitates the explanation of difficult sentences and phrases.

The difficulty in many English sentences lies in a metaphor. The English language contains many metaphors Now a metaphor is a condensed simile, and, if a metaphor is expanded into a simile, the difficulty often vanishes Pupils should be trained to find out the point or points of comparison in a metaphor. For example, in the sentence, 'He is a lion in the fight', the point of comparison lies in the quality of bravery. The metaphor can thus be expanded into a simile as follows: 'He is as brave as a lion in fighting.' Similarly the metaphor in the sentence, 'The ground was covered with a carpet of snow', may be explained as follows by turning the sentence into a simile. 'Just as the floor of a room is covered by a carpet, so the surface of the ground was covered by snow.'

The difficulty of understanding long and complicated sentences is necessarily greater than that of understanding short and simple ones. A good plan, therefore, is to split up long and complicated sentences into shorter ones before attempting an explanation Take for example the following sentence: 'The very reasonable revolt against memorized lists of capes and bays has caused modern geographers to swing the pendulum too far in the opposite direction so that there are justified complaints that many pupils proceeding to more advanced work are insufficiently grounded.' This sentence may be split up as follows: 'There has been a very reasonable revolt against memorized lists of capes and bays. This has caused modern geographers to swing the pendulum too far in the opposite direction. Consequently there have been justified complaints that pupils proceeding to more advanced work are insufficiently grounded.'

A large number of English sentences are complex and it is essential that pupils should thoroughly understand the structure of these sentences. In studying unseen passages, therefore, the opportunity may be taken of giving the students practice in the analysis of complex sentences into clauses.

It is most desirable that pupils should clearly understand which is the main clause in a complex sentence and which are the subordinate clauses and how the different clauses are related to one another. Once clause analysis is clearly understood, pupils will have a guiding principle which will enable them not only to understand the structure of English sentences that are read or heard, but also to construct sentences correctly themselves.

In an unseen passage pupils are often asked to give a summary of the passage or part of it. Sometimes, however, the pupils have no clear idea of the length that the summary should be. Consequently some are inclined to give a kind of paraphrase of the whole passage about as long as the original passage Ordinarily a summary about one-third as long as the original is quite long enough. To write a good summary pupils must be trained to look for the important points in the passage and to leave out the unimportant points.

The correction of the pupils' written answers presents some difficulty. If the teacher can find time to correct all the answers out of class, so much the better. If this is not possible, he may call on two or three boys to read out what they have written and comment on the answers. Finally he may write on the blackboard the best answer.

Aids to the teaching of English

A good blackboard is essential and it should, if possible, extend across the width of the room on the wall behind the teacher's table. Besides writing on it the words and sentences which he desires to impress visually on the minds of the pupils, the teacher should use the blackboard for drawing rapid sketches to illustrate explanations and stories. If the teacher can sketch rapidly, his usefulness is much increased

Pictures are useful, particularly those on which conversation can be based. Teachers who can draw should provide themselves with a stock of pictures that can be used to illustrate the stories that they tell to their classes to form the basis of oral and written work. A clock dial made of wood or cardboard is useful for teaching the time of day, and a calendar for teaching the months and dates. Models made of clay or other material and specimens of various kinds often come in handy.

Many schools in England use the gramophone as an aid to good pronunciation and intonation in teaching foreign languages. The writer's experience with the gramophone in teaching has not been altogether satisfactory for two reasons ; first, because the majority of available records have not been very suitable for Indian schools and, secondly, because the reproduction of words from gramophones of moderate price has not been very clear. It is possible that these defects may be removed in the future, and that the gramophone may become a useful adjunct to English teaching.

Some people think there is a bright future in school teaching for lectures broadcast by wireless and a good deal is being done on these lines in England. In India, however, except in the neighbourhood of Bombay and Calcutta wireless reception is not very satisfactory at present. Given good reception and a satisfactory teaching programme, there is no reason why wireless should not become a useful aid to the teaching of English, especially for the teaching of correct pronunciation and intonation. But it must be remembered that the gramophone and wireless can only be supplements to the teacher's work and can never replace the personality of the teacher.

Some schools make successful use of the school magazine and of class magazines for encouraging original composition.

The phonetic method

English spelling is irrational. The letter *c* for example, is sometimes pronounced as *s*, as in *place*, and sometimes like *k*, as in *cat*. The combination *ough* represents six different sounds, as in the words *plough, rough, cough, though, through, thorough*. The conventional alphabetical spelling is therefore no guide to the pronunciation. This unfortunate fact is one of the greatest stumbling-blocks in the way of the learner of English. To circumvent this difficulty many teachers of English, especially on the continent of Europe and in Japan, have had recourse to what is known as the phonetic method. To explain this method it is necessary to say briefly what Phonetics is.

Phonetics is the science of the sounds of a language. Each sound is classified according to the method by which it is produced. For example, *p* and *b* are formed by the lips, *t* and *d* by the point of the tongue placed against the back of the upper front teeth, *k* and *g* by the back of the tongue placed against the palate. For each separate sound there is a separate phonetic symbol, which may or may not correspond to an alphabetical letter. In English there are twenty-six letters in the alphabet, but there are actually thirty-eight sounds, each of which is represented by a phonetic symbol.

Teachers who use the phonetic method first practise their pupils thoroughly in the correct sounds and teach them the phonetic symbols. For several months they give their pupils only books written in the phonetic script. It is claimed for this method that, as the pupils are not confused by irrational spelling, their progress is very rapid. The correspondence of the phonetic script to the spoken sounds is also a factor favouring correct pronunciation.

The obvious objection to the phonetic method is that the ordinary spelling must be learnt sooner or later, so that pupils have to learn two systems of spelling, the phonetic and the ordinary. Whether the rapidity of the progress made during the period when only phonetic script is used counterbalances the disadvantage of having to learn two systems of spelling can only be decided by a series of carefully controlled experiments, which, as far as the writer is aware, has not so far been attempted.

Whatever view may be held about the value of the phonetic method in schools, there can be no doubt that a systematic training in English phonetics is of the greatest value to teachers of English and should find a place in all training courses for English teachers. Spoken English is learnt chiefly by imitation and it is obviously of the first importance that teachers should be able to pronounce English correctly and to train their pupils in the correct formation of the sounds of the English language with or without the aid of symbols It is specially important that the first English class should have a teacher whose pronunciation is good and who is able to drill his pupils in the correct sounds.

The following are some of the points in pronunciation which need careful teaching . the vowel sound in words like *ball, form, walk*, written phonetically ɔ ; initial *s* in words like *stamp, spot*, frequently mispronounced *istamp, ispot ;* the distinction between *v* and *w* , the fact that *r* is not pronounced unless it is followed by a vowel It should be emphasized also that the vowel

sound in words like *go* and *so* is a diphthong composed of the sounds *o* and *u*, that the vowel sound in words like *fine* and *write*, is a diphthong composed of the sounds *a* and *i*, and that the vowel sound in words like *fame, hate*, is a diphthong of the sounds *e* and *i*.

General

Throughout the teaching of English it must be realized that using a language is an art that can be acquired by practice only. The teacher can provide the exercises, see that they are carefully graded in difficulty, furnish models to imitate, correct mistakes, and generally guide and stimulate the learners. The learning, however, must be done by the pupils themselves and can be done in one way only and that is by actual practice in using the language, practice in speaking, understanding, reading and writing the language. It is the teacher's business to see that his pupils get this practice.

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CHAPTER 7

THE TEACHING OF MATHEMATICS

The science of Mathematics deals with certain fundamental concepts of number and space, with logical propositions derived from these concepts and with practical applications of the propositions so derived to everyday computation and measurement. Thus the science of Mathematics is both abstract and concrete. It is abstract in the sense that it is an organized logical structure built upon certain postulated foundations; it is concrete in the sense that it can be brought into correspondence with our intuitive notions of number and space and with a practical interpretation of the physical universe in which we live. Thus we study Mathematics partly because of its importance in modern life and partly because, to use the words of Sir T. P. Nunn, 'it represents one of the grandest achievements of the human spirit' Our aim in teaching Mathematics is, therefore, partly *utilitarian* and partly *cultural*

The Number System of Elementary Mathematics

The raw materials of mathematical computation and measurement are *numbers*, which may be, either the *natural numbers* (1, 2, 3, – – – –) used in counting or the *fractional numbers* ($\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{5}$, – – – –) which are definite parts of natural numbers The natural numbers and the fractional numbers together form the system of *rational numbers*, or numbers expressible in ratio form. Numbers which cannot be so expressed are called *irrational numbers*. The number $\sqrt{2}$, the ratio of the length of the diagonal of a square to that of one of the sides, cannot be expressed as a fraction, either vulgar or decimal. It is possible to find two numbers, say 1 41 and 1·41, or 1·414 and 1·415, between which the number which we represent by the symbol $\sqrt{2}$ must lie, but it is not possible to find a *single* fractional number equivalent to the irrational number $\sqrt{2}$. The rational and the irrational numbers together form the system of *real* numbers.

The fundamental operations of Arithmetic and Algebra are addition, subtraction, multiplication and division. It cannot be too strongly emphasized, however, that these operations admit of more than one meaning. Thus, the plus sign (+) and the minus sign (–) may have a variety of meanings. Some of these we may illustrate with a sequence of natural numbers as follows·—

Take the following example·—

Directed numbers

The heights of 21 boys in a scout troop were given in inches as follows·—

64, 63, 62, 61, 62, 60, 45, 52, 72, 62, 61, 69, 66, 63, 59, 65, 58, 54, 56, 49, 57.

Arrange the boys in order, tallest on the right, shortest on the left, and draw a diagram to represent them

The order of heights is —

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
45	49	52	54	56	57	58	59	60	61	61	62	62	62	63	63	64	65	66	69	72

The graph of these heights placed at equally-spaced horizontal intervals is called a *variation array*. (Fig. 1)

Now suppose that the scoutmaster required the boys to 'fall in' in the same order every day The most expeditious way to do this would be to give each boy a number corresponding to his position in the array. The 45-inch boy would be Number 1, and the 60-inch boy would be Number 9 The boys would simply remember their numbers and the convention that, as seen by the scoutmaster facing them, 2 is on the right of 1, 3 on the right of 2, and so on. The numbers would be even more useful than names, for a stranger would be able to direct the troop through their numbers But there are other ways of numbering the troop Suppose we begin numbering them from the middle, and give No 11 a new number, No. 1, and No. 12, the new number, No 2, and so on. The question is What numbers shall we give to the old numbers 1, 2, 3, - - - - 10 ? Now, since each boy's number is one less than that of his left-hand neighbour, the old No 10 must be numbered 1 - 1 or 0, and No 9 as *one less than* No 0 ! This is usually written as -1. No 8 will now be No -2

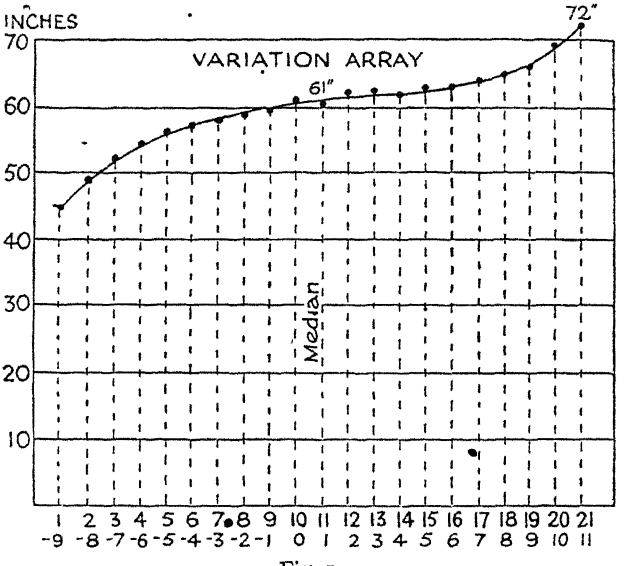


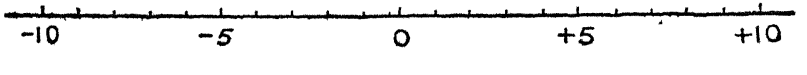
Fig 1

So we get the old and new numbering, thus —

1	2	3	4	5	6	7	8	9			
-9	-8	-7	-6	-5	-4	-3	-2	-1			
10	11	12	13	14	15	16	17	18	19	20	21
0	1	2	3	4	5	6	7	8	9	10	11

The new numbers -1, -2, -3 - - - are called *negative numbers* to distinguish them from the *positive numbers*, which are sometimes written +1, +2, +3 - - - -. The + and - signs are, in these cases, *signs of direction*. Such a system of positive and negative numbers, connoting direction as well as magnitude, is called a system of *directed numbers*. This term was first used by Sir T. P. Nunn

The system of directed numbers may be represented by points on a straight line, which we shall call an *axis of reference* The point O is called the origin or starting-point



Directed numbers have associated with them direction as well as magnitude, and are generally written in brackets $(+5)$, (-3), $(+a)$, $(-b)$. A straight line drawn to represent a directed number is called a *vector*.

Extended idea of direction

The word 'direction' calls to mind such concepts as right or left, north or south, up or down, above or below, but the term is now being applied more widely We speak of a year hence as a year in the forward direction, of a good bank balance as being in the right direction, of a man of bad character as going in the downward direction. So we use directed numbers to specify any quantities which may occur as opposites. The following list will be found useful for reference. (right, left), (up, down), (above, below), (north, south), (east, west), (more, less), (add, substract), (credit, debit), (profit, loss), (hence, ago), (ahead, behind), (to, from), (in, out), (early, late), (quicker, slower), (forward, backward). The first term in each bracket is usually given a positive, and the second a negative, connotation. For example we write. Rs 500 credit as Rs $(+500)$, 10 years ago as (-10) yr, five minutes early as $(+5)$ min, fifty yards backwards as (-50) yd.

From this idea of opposites, follows the convention that

$(+5)$ ml south is (-5) ml north,
(-5) yd ahead is $(+5)$ yd. behind;
(-10) days hence is $(+10)$ days ago

Examples :—

1 I walk 4 miles north in the first hour, and 3 miles north in the second hour How far am I from my starting-point?

Answer $(+4)+(+3)=+7$, or 7 miles north

2 I walk 4 miles north in the first hour, and 3 miles south in the second hour. How far am I from my starting-point?

Answer: $(+4)+(-3)=+1$, or 1 mile north.

3. I walk 4 miles north in the first hour and 5 miles south in the second hour. How far am I from my starting-point?

Answer: $(+4)+(-5)=-1$, or 1 mile south.

4 I set out for a place 5 miles north In the first hour I go 3 miles north Now much further have I to go?

Answer: $(+5)-(+8)=-3$, or 3 miles south

We are now in a position to summarize the various uses of the + and − signs that have been discussed.

The plus and minus signs

1. The + and − signs are used to distinguish *two types of numbers*, called positive and negative numbers (a, a'), where $a=-a'$, and $a'=-a$.

2 The + and − signs are used to denote *direction* in an order or sequence.

3 The + and − signs are used to indicate *opposites*. The opposites of equal numerical magnitudes produce a zero result, thus $(+a)+(-a)=0$

4 The + and − signs are used to indicate *operations*. The + sign is used when combining components to produce a resultant, and the − sign when resolving a resultant to find a component

The rule of signs

When performing the operation of multiplication with undirected numbers the question of sign does not arise, but when we deal with directed numbers attention has to be given to the 'rule of signs' which may be expressed —

$(+a)(+b) = +ab$, $(-a)(+b) = -ab$;
$(+a)(-b) = -ab$, $(-a)(-b) = +ab$

The question is sometimes asked : How can the rule of signs be proved ? The answer is that, strictly speaking, the rule of signs cannot be proved. As J. W. Young puts it in his *Fundamental Concepts of Algebra and Geometry* 'There can be no such thing as an *a priori* proof of these laws of signs , they are pure conventions, finding their justification on the logical side in their consistency with previous assumptions and on the practical side in their serviceableness.'

But what cannot be proved may be illustrated, and the teacher should use every opportunity to do so in the school course. Many such opportunities will arise.

Illustrations

The great difficulty with regard to the rule of signs lies in the fact that a product may have many meanings. For example, an area is a length length product, distance traversed is a rate.time product, total cost is a quantity.rate product, and so on Let us study two of these.

Length.length products

Example I. 1. XOX' and YOY' are two perpendicular axes intersecting in O. Let a point 'move' from O to A in the direction OX (which we call the positive direction) a distance $(+a)$ Now, let us imagine the line OA to be an extremely thin rod and let it move at right angles to itself in the direction OY a distance OB, which we shall call $(+b)$. We shall thus trace out a rectangle (S). Since the rectangle is traced out by a *positive rod moving in a positive direction*, we may define the area S as a *positive area* $(+S)$.

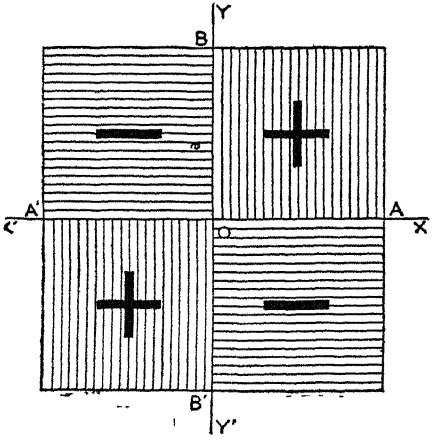


Fig. 2.

So $(+S) = (+a).(+b)$

2. Now let the same rod OA move in the negative direction to OB' (opposite to OB) a distance $(-b)$ Since the area now traced is made by the rod OA moving in the direction opposite to that moved before, we may call this a *negative area*

So $(-S) = (+a).(-b)$.

Again, we may trace this same negative area by moving the negative rod OB' $(-b)$ in the positive direction OA $(+a)$.

So $(-S) = (+b).(-a)$.

3. We may now move the negative rod OB' $(-b)$ in the negative direction OA' $(-a)$. Since the area is traced by moving the rod OB' in the opposite direction to that of the last case, the area will be positive.

Thus $(+S) = (-b).(-a)$

Again, we may trace this positive area by moving the negative rod OA' in the negative direction OB' and derive—

$(+S) = (-a).(-b)$

4 Finally, we may move the negative rod OA' in the positive direction OB, opposite to that given in the last case and get—

$(-S) = (-a).(+b)$,

and as before—

$(-S) = (+b).(-a)$.

The student who finds the concept of a 'negative area' difficult to understand should remember that it is merely a matter of definition A negative area is an area traced out or measured in a particular way.

Example II.—*If a train move at the rate of* 30 *miles per hour* ($\frac{1}{2}$ *mile per min.*), *how far will it go in* 6 *minutes* ?

Rate.time products

Answer: Distance = rate.time or $\frac{1}{2}.6 = 3$ miles.

Now, near the City of Bombay there are (or were) three local railway-stations (Fig. 3) Colaba (C), Marine Lines (M), and Grant Road (G),

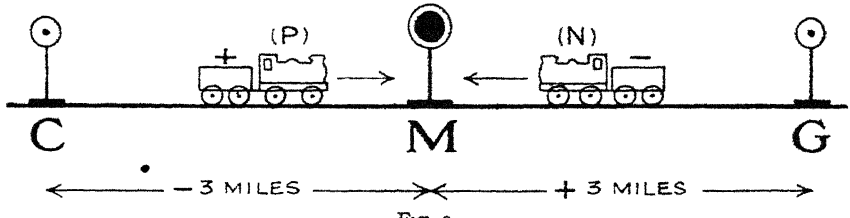


Fig. 3

in order about 3 miles apart. Two trains travel, one (P) from C to G at the rate of 30 miles per hour, and the other (N) from G to C at the same rate.

Let us take M as our origin, MG as the positive direction from M, and MC as the negative direction from M.

Then $MG = +3$ miles, and $MC = -3$ miles.

Again, since P is going towards G, its speed may be put down as $+\frac{1}{2}$ mile per minute, and that of N as $-\frac{1}{2}$ mile per minute.

Let us now answer the following four questions :—

1. Where will P be 6 min. *after* passing M ? Answer: At G, $(+3)$ ml.
2. Where was P 6 min. *before* passing M ? Answer: At C, (-3) ml.
3. Where will N be 6 min. *after* passing M ? Answer: At C, (-3) ml.
4. Where was P 6 min. *after* passing M ? Answer: At G, $(+3)$ ml.

Now the speed of P is $(+\frac{1}{2})$ ml. per min., and of N $(-\frac{1}{2})$ ml. per min. Again, 6 min *after* may be written $(+6)$ min. and 6 min *before* as (-6) min.

Therefore, we get for the four questions :—

Distance = rate.time

$(+3) = (+\frac{1}{2}).(+6)$
$(-3) = (+\frac{1}{2}).(-6)$
$(-3) = (-\frac{1}{2}).(+6)$
$(+3) = (-\frac{1}{2}).(-6)$

which again illustrates the *Rule of Signs*.

(The student is advised to work out problems like the following: A man, named Gopal, saves money at the rate of Rs. 12 per month; another man, named Rama, loses money at the same rate. Compare their financial positions five months hence and five months ago with their positions now.)

The function concept

In recent years considerable emphasis has been placed on the idea of functional relationship between variable quantities or, as it is called, 'the function concept'. Until a very few years ago, school Mathematics was taught as a static science, the learning of Algebra meant little more than acquiring the mastery of certain mechanical skills, and Geometry little more than the ability to memorize a number of fixed theorems and their applications to certain standard exercises. The two branches of Mathematics were looked upon as distinct and separate subjects, having little or no connexion with one another. To-day Mathematics has become a dynamic science, a study of associations and relationships, of changes that occur between related variable quantities.

In this way Mathematics has come closer to real life, for we are by nature 'functionally minded'. We realize, for example, that cause and effect follow each other, that success in life is a function of many variables (inherent mental ability, environment, health, tenacity of purpose, emotional stability, and so on), that the price of food depends on many factors (rainfall, temperature, world markets, etc). In the past those who have had strong leanings towards the utilitarian in education have often thrown doubt on the value of Mathematics (beyond the elements of Arithmetic) To-day that criticism is being met in two ways; one, by bringing the subject matter of Mathematics itself in closer relationship with life, and the other, by making the study of Mathematics a better training in functional thinking. It has now been conclusively proved that, when Mathematics is taught in a dynamic way, by making the idea of functional relationship dominant, it 'carries over' or 'transfers' well into everyday life. In other words Mathematics properly taught is good 'mental discipline'. The teacher who is always on the look-out for rules and formal steps of method to guide him in his work will, probably, be disappointed to learn that the function concept cannot be reduced to a stereotype formula; it is not a method but an attitude or point of view. But since we can enunciate no rules of procedure, we give a few illustrations to help the teacher to grasp the idea.

1. Suppose that we are dealing with the formula $I = p.r.t$ or $A = \pi R^2$.

In addition to the substitution problems commonly given, such questions as the following should be considered:—

How many variables and constants are there in these formulae?

If the rate is doubled, what will happen to I?

If R is halved, what will happen to A?

If r is increased 10%, by what per cent will I increase?

If R is increased 10%, what will happen to A?

Make a 'ready reckoner' or graph to enable you to read off values of I for $p = 500$, $r = 5/100$ for values of t between 1 and 10? Similarly, for the other formula. A large variety of such problems can be made up by the teacher.

2. When discussing the triangle in which two sides and the included angle are given, the following variations could be considered.—

What will happen to the third side if one of the sides is increased, the other side and the included angle being kept constant? Measure the sides for 8 different positions and draw a graph to show their relation.

What will happen to the third side (and the other angles), if the included angle is gradually increased, the two sides being kept constant?

Make a table showing the variation of angle and third side.

Examine the area of the triangle as the sides or angles vary.

Make a graph of the sine of the angle and the third side.

Show that the Theorem of Pythagoras is a special case of a more general theorem (This would come later.)

3. As a simple example of functional relationship let us take the following: $y = \frac{1}{2}x + 1$ Here we have two variables: x and $\frac{1}{2}x + 1$. We note that as x increases $\frac{1}{2}x + 1$ (or y) also increases; as x decreases, y decreases. When $x = 0$, $y = 1$; when $y = 0$, $x = -2$. We may make a table of values of x and y.

(1)	(2)	(3)	(4)
x	y $\frac{1}{2}x+1$	Δx	Δy
0	1		
2	2	2	1
4	3	2	1
6	4	2	1
8	5	2	1
10	6	2	1

We note that x increases more rapidly than y The table shows that when x increases by 2, y increases by 1 (see columns 3 and 4). The change in x we mark as Δx (where Δ means 'change in') and the change in y as Δy. We find that

$$\frac{\text{change in } y}{\text{corresponding change in } x} = \frac{\Delta y}{\Delta x} = \frac{1}{2}$$

This is called the '*rate of change*' of y with respect to x. We now draw a graph of $y = \frac{1}{2}x + 1$, using the values in columns (1) and (2) and note again that 'change in y' divided by 'change in x' is constant for any two points taken on the graph and is equal to $\frac{1}{2}$. This is a general property of the straight line and, incidentally, of the first-degree equation.

We may, with the aid of the graph, solve equations such as $\frac{1}{2}x + 1 = 6$, $\frac{1}{2}x + 1 = 3$, $\frac{1}{2}x + 1 = -2$, and so on

4 Graphical work is often reduced to a mechanical plotting of points. The subject becomes intensely interesting if it is pointed out that the graph is a representation of a functional relationship between two or more quantities. The graph of $y = x^2$, for example, may be used to solve equations like $x^2 = 4$, $x^2 = 5$, $x^2 = 4x + 3$, $x^2 = 4x + 4$, and even $2x^2 = 3x + 2$. Answers to the following questions could be found from the graph: If x is increased 10%, how much per cent is x^2 increased? Verify by taking several points

Given $\pi = 22/7$, find the area of a circle of radius 3 inches

The graph $y = x^2$ is moved, without rotation, so that the apex comes to the point (3, −1), (the axes being kept fixed) Find the equation of the graph in the new position Cut out a trace of the graph $y = x^2$, and find the equation of this trace when it is moved over the graph paper, without rotation, to new positions Make a table showing values of x and corresponding values of x^2 for each integral value of x from 0 to 8 Make two other tables showing the 'change in x' and the corresponding 'change in x^2' for each unit increase. Verify from the graph.

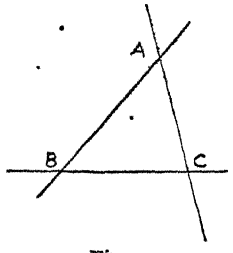


Fig 4.

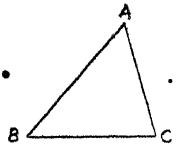


Fig 5

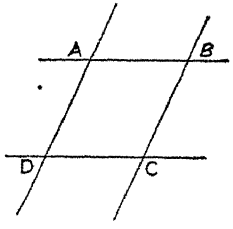


Fig. 6.

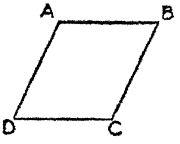


Fig. 7.

5. Many relationships in Geometry can be more easily seen if, in the elementary stages, the fundamental concepts are given broader treatment. For example, if the triangle is defined as the figure formed by three non-concurrent intersecting straight lines of unlimited length (Fig. 4), the exterior and interior angles are seen in their right relation from the start.

Similarly, if the parallelogram is introduced as Fig. 6 rather than as Fig. 7 many difficulties usually met with later will be avoided. Again, many properties of tangents and chords of a circle may be shown to be special cases of more general theorems. A discussion of these cases is a fitting introduction to the general idea of limits.

The Fundamentals of Geometry

Great as the changes in the teaching of Algebra have been in recent years, the changes in the teaching of Geometry have been no less significant. A generation or so ago Euclid's *Elements* was the generally accepted text-book of Geometry: to-day there are almost as many systems of geometrical teaching as there are schools. This change has come about partly through the general demand for a more psychological approach to the subject of Mathematics and partly through the critical examination, during the past hundred years, of the fundamental concepts of Geometry. An adequate discussion of these considerations is not possible in this book, but the student is strongly advised to study the *Report on the Teaching of Geometry in Schools*, Mathematical Association (G. Bell & Sons), and *The Fundamental Concepts of Algebra and Geometry*, by J. W. Young, with which every teacher of Mathematics should be familiar. Now a mathematical science is 'any body of propositions arranged according to a sequence of logical deductions', and 'the starting-point of any mathematical science must be a set of one or more propositions which remain entirely unproved'. (J. W. Young) The examination of the fundamentals of Geometry, to which we have referred, was concerned chiefly with the elementary terms used in Geometry, the postulates or special assumptions upon which a logical system may be based and the consistency and independence of those assumptions. It was found, strangely enough, that, whereas one set of consistent assumptions led to the Euclidean Geometry with which we had been familiar, other sets of consistent assumptions led to other types of Geometry, to which the name *Non-Euclidean Geometry* is now given. For our immediate purposes we need consider only the implications of these investigations as far as they affect elementary Geometry.

1. The terms ' point ' and ' line ' may be regarded as intuitive, requiring no definition. For elementary school Geometry we may leave ' point ' undefined and define a line as the geometrical figure made as a point is ' moved ' or as our attention is continuously transferred from one point to another

2. Objection has been taken to the treatment of ' congruence ' by the method of superposition. The Mathematical Association, in the *Report* referred to above, postulates that ' any figure (plane or solid) can be exactly reproduced anywhere ' (Principle of Congruence). All that is necessary, then, for a proof of congruence is that the given data should enable one to produce the two figures in only one way. In other words, if we can copy a given triangle, when two sides and the included angle are given, *in only one way*, the two triangles (the original and the copy) are congruent.

3. Ever since the time of Euclid, and indeed years before, ' parallel lines ' have been the subject of keen controversy. Euclid prepared the way for his discussion of parallels by an assumption (Postulate 5), which generations of mathematicians have tried to obviate Some have tried to introduce parallels without any special assumption whatever. We now know that this endeavour was futile, because an assumption of some kind must be made, the only question being: Which assumption is the most acceptable? The Mathematical Association, following the lead of Sir Percy Nunn, recommends that the *Principle of Similarity* be assumed, namely, that ' any figure can be reproduced anywhere on any enlarged or diminished scale '. Granted this assumption all the usual theorems on parallels may be demonstrated There is much to be said for this generalization, which would be accepted without any question by the average schoolboy

4. Care must be taken in the use of the word 'direction'. Strictly speaking our conception of ' the same direction ' depends upon our knowledge of parallel lines and should, therefore, come after parallel lines have been dealt with and not before.

5. The treatment of ' limits ' and ' incommensurables ' needs special care Too often proofs involving incommensurables given in school textbooks are defective, if not altogether wrong.

6. The choice of the fundamental theorems of school Geometry and the sequence of such theorems is a matter for the practical teacher to decide. It is wise not to make the number of theorems too large. Most of the so-called ' theorems ' of elaborate school geometries could be looked upon as useful exercises on a few main theorems.

7. As far as possible solid Geometry should be treated side by side with plane Geometry. One defect of the teaching of Geometry in the past has been the division of the subject into compartments, ' plane ' and 'solid'. Geometry is the science of spatial relationships and should be treated as such. The fusion of plane and solid Geometry would help to bring to the subject the reality, which is so lacking to-day.

8. It is essential, not only that the pupil should be able to reproduce the ' proof ' of a theorem but that he should appreciate the nature of a proof. Demonstrative Geometry may be expected to carry over into life only so far as the logical methods of demonstration are consciously followed

Geometrical proof may be either *direct* or *indirect*. In the direct proof we proceed from given data by logical steps to the required conclusion, in the indirect proof we show that, by assuming the contradiction of the theorem to be true, we are led to a conclusion we know to be false One form of the indirect method of proof is that known as the *method of elimination*, which runs as follows: There are in this problem, say, three possibilities, of these two can be proved to be impossible; therefore, the third must be true. This method is commonly used in life The doctor uses it in diagnosis and the magistrate in conducting a case

The logical methods of *analysis* and *synthesis* require special attention In the method of analysis we assume the conclusion to be true and work back until we arrive at the given data We then reverse the order of the steps we have followed and build up the proof by synthesis. Most of the theorems of school Geometry can be proved by an intelligent pupil when he is trained to think in this way Mere assent to the proof given by another is not creative thinking.

Stages in course

9. Finally, we may pass on the recommendation of the Mathematical Association that the course in Geometry should be divided into three stages.—

(a) The *Experimental Stage*, in which the pupil learns to use the tools of Geometry;

(b) The *Deductive Stage*, in which the more difficult theorems (congruence, parallels, etc) are assumed, and easy exercises are given on these theorems

(c) The *Systematizing Stage* in which the knowledge of the pupil is systematized and gaps filled up

Having completed this discussion of some of the fundamental concepts of Mathematics, we now turn our attention to the individual 'subjects' which compose school Mathematics These are Arithmetic, Algebra, Geometry and Trigonometry. It is unfortunate that, in most Indian schools, these divisions of school Mathematics are taught almost as separate subjects. Teachers do not seem to realize that they can make the study of Arithmetic and Geometry much more interesting by the use of algebraic processes and the study of Algebra much more convincing by the use of geometrical illustrations. There is a general tendency, at the present time, to treat school Mathematics as 'General Mathematics' in which Arithmetic, Algebra and Geometry are united into a composite whole While this is so, there are certain problems which are peculiar to the separate branches of the subject and these we shall briefly discuss.

Space will not permit anything like a detailed discussion of this subject but attention may be directed to the following points.—

The teaching of Arithmetic

1. The fundamental operations of Arithmetic are addition, subtraction, multiplication and division, which are reducible ultimately to addition and multiplication. It should be remembered that the signs $+ \; -, \times, \; -$ admit of more than one meaning. The plus and minus signs, as we have already seen, mean much more than 'add' and 'take away'. The teacher should be constantly on

his guard against the tendency to restrict the meaning of these signs in this way

2. While there are no fixed rules of procedure for the fundamental operations, the opinion of teachers is generally in favour of those illustrated in the following examples —

(a) *Subtraction*

97 Read $3+4=7$ Put down 4.
43 $4+5=9$ Put down 5.
54

This is known as the method of *complementary addition.*

(b) *Subtraction*

97 Read 8 is more than 7, add 10 making 17
58 $8+9=17$ Put down 9
39 Since we added 10 to make 17, we add 10 to 50 (in 58) to make 60
$1+5=6$ plus $3=9$ Put down 3.

This is called the method of *equal additions.*

(c) *Multiplication*

149 × 235		or	149 × 235
235			235
29800			298..
4470			447.
745			745
35015			35015

(d) *Short Division*

4 | 57427 — 14356—3 rem.

9 | 18087 — 2009—6 rem.

(e) *Long Division*

	83	or	83
62	5197		62 \| 5197
	496		237
	237		51 rem.
	186		
	51 rem		

Read:

(a) 62 into 519 gives 8 Put down 8 (above).
$8 \times 2 = 16$ *and* $3 = 19$ Put down 3.
$8 \times 6 = 48$ *and* $1 = 49$ *and* $2 = 51$ Put down 2.

(b) Bring down 7, making 237
62 into 237 gives 3 Put down 3 (above).
$3 \times 2 = 6$ *and* $1 = 7$ Put down 1
$3 \times 6 = 18$ *and* $5 = 23$ Put down 5.

(f) *Decimals, Multiplication*

32 63
24·57
652·6
130·52
16·315
2 2841
801·7191

(g) *Decimals, Division*

4·147
5·71 | 23·682
22·84
·842
·571
·2710
·2284
·04260

(h)

23·682 ÷ ·0571
= 2368·2 ÷ 5·71
= 414 7

Contracted Methods

(i) *Multiplication*

13·456735 × 18·437375 to 2 decimal places

Keeping *two more places* than we need in the answer.—

13·4567 Read: Multiply by 18 in the ordinary way
18 4374 As soon as we multiply by the *first figure of the decimal* (4), we cross out the last figure of the multiplicand (7)
134·567· Now 4 × 7 = 28 (approx. 30), carry 3.
107·6536 4 × 6 = 24 *and* 3 = 27. Put down 7, and so on.
5·3827
·4037
942
54
248·1066

(j) *Division*

Divide 12 358745 by 4·585592 to 3 decimal places.

Keeping *one more place* than we need in the answer.

2·695
4·5856 | 12·3587
9·1712
3·1875
2·7514
·4361
·4127
234
229
5

Compound Multiplication and Division

(k) *Multiplication*

Multiply Rs. 24 – 5 – 6 by 35.

Rs	a	p	
24 –	5	– 6	
720 –	150	– 180	× 30
120 –	25	– 30	× 5
12 –	17	– 210	
852	192	6	
		0	

Note.—The pies column is added first, converted into annas and pies, the annas being added into the annas column; similarly for the other additions.

Answer: Rs. 852 – 0 – 6.

(l) *Division*

Divide Rs 197-5-9 by 17.

$$\begin{array}{r|l} & 11 - 9 - 9 \\ \hline 17 & 197 - 5 - 9 \\ & 17 \quad 160 \quad 144 \\ & 27 \quad 165 \quad 153 \\ & 17 \quad 153 \quad 153 \\ & 10 \quad 12 \quad \ldots \end{array}$$

3. Care must be taken when dealing with ratio and proportion.

A *ratio* is a *number* which expresses a relationship between two quantities *of the same kind.*

A *rate* is a relationship between two quantities *of different kinds.*

Proportion is a relation of equality between two ratios.

Thus $\frac{1 \text{ foot}}{1 \text{ inch}}$ is a ratio; $\frac{1 \text{ foot}}{1 \text{ second}}$ is a rate;

And $\frac{24 \text{ ft}}{20 \text{ ft}} = \frac{6}{5}$, $\frac{12 \text{ sec.}}{10 \text{ sec.}} = \frac{6}{5}$.

So $\frac{24 \text{ ft.}}{20 \text{ ft}} = \frac{12 \text{ sec}}{10 \text{ sec.}}$

Expressed in terms of rates, we have:—

$$\frac{24 \text{ ft}}{12 \text{ sec}} = \frac{20 \text{ ft.}}{10 \text{ sec.}}$$

(m) *Proportion*

If 14 lb of rice cost 21 annas, how much will 48 lb. cost?

Method of Unity

14 lb cost 21 annas

1 lb. costs $\frac{21}{14}$ annas (less rice, less money)

48 lb cost $\frac{21}{14} \times 48$ annas (more rice, more money)

$= 72$ annas $=$ Rs. 4-8-0.

Method of Proportion

14 lb. cost 21 annas

48 lb. cost ? annas

Answer: $21 \times \frac{48}{14} = 72$ annas (more rice, more money).

(n) *Inverse Proportion*

If 14 men reap a field in 12 days, how long will 48 men take, working at the same rate?

Method of Unity

14 men can reap the field in 12 days

1 man ,, ,, ,, 12×14 days (less men, more days)

48 men ,, ,, ,, $\frac{12 \times 14}{48}$ days (more men, less days)

$= 3\frac{1}{2}$ days.

Method of Proportion

14 men can reap the field in 12 days.

48 men " " " $12 \times \frac{14}{48}$ days (more men, less days).

$= 3\frac{1}{2}$ days.

(o) *Compound Interest*

Find the Compound Interest on Rs 475 for 2 yr. at 5% per annum.

Rs. 475·

23·75 — 1st year interest. Multiply by 5 and move *two* decimal places to right.

498·75

24·9375

523·6875

475·

48·8675

Answer. Rs. 48 – 13 – 11.

The teaching of Geometry: stages of instruction

It is now generally agreed that rigorous demonstrative Geometry should not come too early in the course In the first year most of the work in Geometry will be practical, the purpose being to get the pupil accustomed to use instruments and to express himself freely in the language of the geometer This will be followed by a more formal study of the subject, the chief aim of which is to enable the pupil to grasp the idea of a demonstration or proof. For the time being the more difficult theorems are assumed to be true In the last stage the subject is 'rounded off', gaps are filled in and the whole structure made coherent and consistent

Assumptions

Geometry may be looked upon as an architectural structure based upon certain foundations and built of certain materials. It is essential to a stable building that the foundations should be secure, and that the materials should be suitable In Geometry our foundations are a set of assumptions; our materials are the laws of thought and our structure is the body of 'truth' that we have developed. Assumptions used in Geometry are of three kinds· basic assumptions of thought or *axioms;* particular assumptions of Geometry or *postulates*, practical assumptions or assumed theorems accepted for psychological reasons Let us illustrate these in turn. As axioms we have 'If equals are added to equals, the sums are equals'; 'Two contradictory statements cannot both be true'; 'A thing must either be or not be.' Among the geometrical postulates we have· 'Only one straight line can be drawn through two points'; 'All right angles are equal.' Practical assumptions are theorems which are difficult to prove but are accepted as true because of their usefulness in solving other theorems. In the first year of Geometry the following theorems may be assumed:—

1. The four congruence theorems.
2. The theorems relating to parallel lines.
3. The theorems relating to similar triangles.
4. The theorem of Pythagoras.

These theorems may be illustrated practically in the first year or so and demonstrated rigorously at a later stage.

In addition to these assumptions we have *definitions*, which are in most cases equivalent to postulates. For example, if I define a straight line as 'the shortest distance between two points', as some teachers do, I am not only defining the line but am postulating that no other line can possibly be shorter than the straight line This, of course, is asking too much of a definition.

Definition

We have already stated that our geometrical structure is the body of 'truth' that we have developed but we must remember that a truth in Geometry, or in any other logical science, is not necessarily 'absolute', for it depends on the particular assumptions made at the outset A proof is a conclusion or truth based on certain assumptions

Proof

Analysis is a method of discovery, and is the only method of treating Geometry, which justifies its study. The steps of the analytic method are as follows .—

Analytic method

I know that certain statements are true.
Among these is the statement A.
I wish to prove that X is true.
Now I can prove X true, if I can prove C true.
I can prove C true, if I can prove B true.
I can prove B true, if I can prove A true.
But I know that A is true.
Hence I can prove that X is true

For example :—

To prove that the line joining the centres of two intersecting circles is at right angles to the common chord.

Analysis —

I could prove $OC \perp$ to AB if I could make the angles ONA and ONB corresponding parts of congruent triangles.

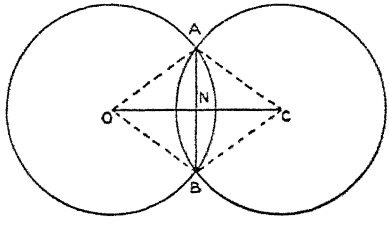


Fig 8.

This suggests the joining of OA and OB

I know that $OA = OB$, and $ON = ON$.

I could prove the triangles congruent, if I knew that angle AON = angle BON, or angle OAN = angle OBN.

I notice that angle AON and angle BON are also parts of the triangles OAC and OBC.

This suggests the joining of AC and BC

I could prove angle AON = angle BON, *if* the triangles OAC and OBC were congruent.

I know that $\left.\begin{matrix} OA = OB \\ AC = BC \\ OC = OC \end{matrix}\right\}$

Therefore the triangles OAC and OBC *are* congruent. (Congruence theorem.)

Therefore I can prove that OC is $\perp$ to AB.

We may now build up the proof by *synthesis*, by retracing the steps of analysis. This we leave to the student.

Geometrical constructions are usually thought out by the analytic process.

Constructions

We *assume* that we are able to make the required construction, and analyse the figure until we arrive at some fact concerning the figure that is known to us.

For example:—

To draw a circle passing through two points and touching a given line

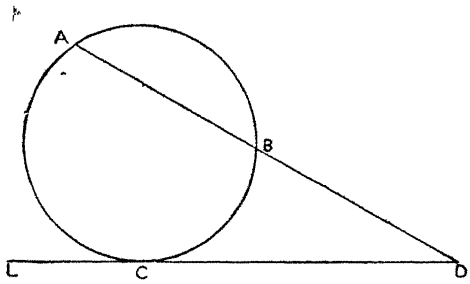


Fig 9.

Let the points be A, B, and the line L.

Suppose ABC is the required circle.

Then CL is a tangent to the circle.

This suggests theorems concerning tangents:—

1. The tangent is $\perp$ to the radius of the circle

2. The angle between a tangent and a chord is equal to the angle in the alternate segment

3. If a tangent and a chord be drawn from a point outside a circle, the square on the tangent is equal to the rectangle contained by the two segments of the chord

1 and 2 are of no use to us because we do not yet know where C is situated.

3 suggests that we join AB and produce it to meet L at D.

We can find C, *if* we can get CD such that $CD^2 = AD.DB$.

Now, we know the positions of the points D, A, B.

We can find C if we can draw a square equal to a given rectangle, and this, we assume, has been done earlier in the course.

The indirect proof

As an example of the indirect proof, we take a proof by elimination.

To prove that in any triangle the greater angle is subtended by the greater side.

Let angle A be $>$ angle B.

Then side a will be $>$ side b.

There are three possibilities:—

Either (1) $a < b$;

or (2) $a = b$;

or (3) $a > b$.

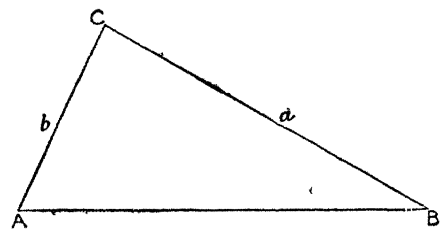


Fig 10.

Now a cannot be $< b$, for then angle A would be $<$ angle B, which is not true, by hypothesis;

And a cannot be $= b$, for then angle A would be $=$ angle B, which is not true, by hypothesis;

Therefore, a must be $> b$.

This proof is essentially that given by Euclid.

For further examples of these methods, see Schultze, *The Teaching of Mathematics in Secondary Schools*.

Many teachers experience some difficulty with regard to 'locus' problems.

Locus

One reason for this is that the concept of locus is not introduced sufficiently early in the course. If the pupil were taught in the first year that the locus (place) of all points equidistant from a given point is a circle and that the locus of all points equidistant from a straight line is a line parallel to the given line, the concept would be accepted naturally and easily. The word 'locus' could often be used instead of 'graph'. 'The locus of all points satisfying an equation of the first degree is a straight line' means the same as the 'graph of an equation of the first degree is a straight line'; similarly, for the parabola. As interesting examples of loci, problems such as the following could be given: 'A man buried his money in a field. When he died, his relatives found a note, which read as follows: "You will find my money 40 yards from the big mango tree, and 30 yards from the fence that divides my field." Where was the treasure?' An interesting point in the problem is that there are four possible places (or loci) for the treasure. Again, various cases may be made by placing the mango tree in various positions relative to the fence.

Some authorities maintain that Geometry should be taught in the following order —

1. Geometry of position;
2. Geometry of shape;
3. Geometry of size.

The concept of locus comes under the first of these headings.

Although no general rules of method can be given for the teaching of Geometry, the following suggestions will be found useful:—

Some hints regarding method

1. The new problem (a theorem or a rider) may be introduced to the class, either with reference to a figure or verbally. For example, we may say: '*AD*, *BE* and *GF* are the three perpendiculars from *A*, *B* and *C* to the opposite sides of this triangle *ABC*. Prove that the three perpendiculars are concurrent,' *or* we may state the problem thus: 'Prove that the three perpendiculars drawn from the vertices of a triangle to the opposite sides are concurrent.' The former of these is to be preferred in elementary work and should be used to lead up to oral statements later.

As far as possible use concrete or practical introductions; for example, the buried money problem given above. Scout problems are excellent for exciting an interest in Geometry.

2. Let the pupils copy the figure into their notebooks and try to solve the problem *unaided*. If they succeed, the teacher has nothing to teach; if not, he will remove the *first difficulty presented*, but nothing more.

The first difficulty will probably be to get a clear understanding of what is given and what is required. The pupils then set to work again, the teacher meanwhile supervising their work and assisting a little, where necessary. If the pupils are still unsuccessful, the teacher will consider suggestions from the class. Parallel lines suggest a rapid revision of theorems on parallels. Equal lines suggest an isosceles triangle, radii of a circle, or congruent triangles, and so on. These suggestions should be discussed and unlikely ones eliminated. The pupils are then invited to try again, with

the further suggestion that they analyse the figure and work by analysis from the conclusion to the data.

3 If a pupil is successful, he will be given other work, until the rest of the class have had sufficient time to try. The successful pupil will then be asked to show *how he analysed the problem*, not to give a demonstration of the proof. Some other member of the class will be asked to supply the proof by synthesis afterwards. Throughout the demonstration the class should cross-question the pupil, and insist on references or reasons (why ?) at each step

4 If no pupil is successful, the teacher will, with the help of questions, proceed to analyse the problem with the class, not necessarily to the end of the analysis, but only as far as he deems it advisable The synthesis, as before, will be supplied by the pupils themselves.

Note.—The object is to get the class to do as much constructive thinking as possible.

5 Reference may now be made to a textbook, if the theorem is one of the set theorems of the book, or it may be written out, if it is not in the book and is considered sufficiently important. In the writing of the proof, see that the data, argument (with references), and the conclusion are clearly stated.

6. Discuss possible variations of the problem and different positions of the figure. It is much more educative to do a single problem, with all possible cases, thoroughly, than a large number of simple exercises on a given theorem.

7. Insist on the pupil *consciously* following methods of mathematical procedure. The words *analysis* and *synthesis* should be part of the classroom stock-in-trade.

The teaching of Algebra: subject matter

A striking change has come over the teaching of Algebra during the past twenty-five years A generation ago the textbook in Algebra began with symbols and substitutions, and proceeded systematically, through addition, subtraction, multiplication and division, to equations and finally to problems. To-day, problems come early in the course, the 'mechanics' of Algebra, so much stressed in earlier days, being taught only as required. Needless to say, the subject has thereby become much more interesting especially as it is now much more closely related to life. Broadly considered, elementary Algebra may be classified under the following heads —

1. The formula,
2 The simple equation,
3 The graph and graphical representation in general;
4. Positive and negative numbers, directed numbers;
5 The fundamental operations; factors and fractions;
6 Quadratic equations.

The formula

The formula is suitable starting material for the study of Algebra, because it introduces the pupil immediately to interesting practical problems and acquaints him with the main algebraic operations.

Exercise may be given in the changing of formula to rule and of rule to formula, the evaluation of unknown quantities in the formula, and such exercises as 'changing the subject' of a formula Excellent illustrations of functional variations may be found in the formula.

The simple equation

The simple equation is a natural product of the formula; in fact, many examples which come under the heading of formulae will be simple equations. In dealing with the simple equation, especially when used to solve problems, it is a mistake to keep to the conventional letter x. It is much better to get the pupil accustomed to use some other letter to express an unknown quantity, say, W for weight, s for distance (space), A for area, n for number, t for time, and to use the letters x, y, z for *variables* in graphical work. Thus to solve the problem: *Twice a certain number decreased by* 5 *gives* 13, *find the number*, the equation may be expressed $2n - 5 = 13$.

Graphs

Graphical representation is not the special preserve of the Mathematics classroom. Graphs are now used in the Geography lesson to show the relative lengths of rivers, heights of mountains, exports of towns, etc They have even been used in the History lesson to depict the changing fortunes of a particular political party. In such cases the *bar graph* is generally used. Graphs are further used in meteorological observations, e g the daily temperature of the schoolroom or the barometric pressure In such cases the *connected line graph* is used Again, in the Science classroom we use a graph to represent the results of an experiment. This is called the *graph of best fit* In Algebra we use the graph to represent the variation of functions, for example, the variation of x with respect to y in the equation $y = 3x + 2$, or $y = x^2$. Such graphs are the *graphs of algebraic functions*. Functions generally have two variables, one called the *independent variable*, to which we give any values we please ($x = 0, 1, 2, 3, 4, - - -$) and the other called the *dependent variable*, the value of which depends on that given to the independent variable ($y = 0, 1, 4, 9, 16, - - -$). The graph represents a relationship between these corresponding variables in geometrical form. An appeal to graphical methods should be made whenever possible, for some pupils will grasp an idea much more readily by graphical illustration than by algebraic analysis.

Directed numbers

The directed number has been fully discussed in another section. It cannot be too strongly emphasized that a clear understanding of directed numbers is extremely important Much of the impatience shown by people towards Mathematics is due to the fact that, when they were students, manipulations with positive and negative numbers, involving the rule of signs, were taught by rule-of-thumb methods. There is no more interesting chapter in elementary Algebra, when rightly taught, than that dealing with directed numbers. We strongly advise the teacher of Mathematics to study *The Teaching of Algebra* (*including Trigonometry*) by Sir T. P. Nunn, in which he will find these problems fully discussed This book has been a source of inspiration to teachers all the world over.

Some remarks on methods

1 Let the teaching be, as far as possible, based on the concrete Use any concrete device (real objects, models, representations of objects, pictures, diagrams, etc.) that will help the class to understand the problem The teacher of Mathematics should have a stock of accessories such as coloured paper, coloured chalk, cardboard, a penknife, a pair of scissors, a balance, mariner's compass, models, etc , ready at hand for the purposes of illustration

2. Let the teaching be directly related to life. Choose, as far as possible, material that is familiar to the child or related to his environment The child will always show an active interest in a project which reflects a 'life situation'. familiar to him.

3. Make sure of the fundamentals from the start, and return to them constantly It is a great mistake to assume that, because a rule can be mechanically applied, progress is being made.

4. Mathematics, when rightly taught, develops certain habits of thought and action such as: accuracy, speed, neatness, observation, originality, simplicity and honesty. Recent experiments go to show that these habits carry over into life to any considerable degree only when they are accepted as *ideals*. It is possible, for example, to have neatness in the Mathematics classroom and slovenliness everywhere else. But if neatness is consciously accepted as a desirable ideal, orderly habits acquired in the study of Mathematics are likely to transfer to other situations in life. Let the pupil see that neatness, being an orderly arrangement of thought, will undoubtedly reduce the liability of error. Let him see that accuracy and honesty pay, but that they are also to be desired for their own sakes. Make the Mathematics lesson an auxiliary to the Composition lesson by showing the value of clear and concise expression of ideas and of neat and orderly arrangement of work.

5 Do not resort to the written symbol when a calculation can easily be done 'mentally' The margins of school exercise books contain much needless figuring It is a good policy to give plenty of practice in 'mental' computations before setting exercises requiring written calculations

6. Encourage a common-sense attitude towards problems and answers Discard all problems that you or the pupils feel to be ridiculous and cultivate in the pupil the habit of examining answers to see whether they are sensible or not. Teach them to apply rough checks before making a long calculation and to compare their answers with the checks so obtained.

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CHAPTER 8

THE TEACHING OF HISTORY

Reasons for including History in the curriculum

History is studied at the present day for its informative, cultural and disciplinary value. It is the story of man and his wonderful development in society through successive ages; it is a great storehouse of information where the child can rummage at will and slake his thirst for knowledge for its own sake; it is a great liberalizing influence widening the mental horizon and fostering a cosmopolitan outlook through a study of different groups of humanity and their contributions to the stock of world civilization; it is, lastly, a great mental training. Memory and imagination are as much trained by History as by Literature and Geography. But the mental training that the boy receives in judging character, in generalizing about wide sweeps of time through a study in comparison and contrast, in arriving at conclusions from existing data, in weighing evidence, and in sifting the truth from conflicting accounts, is unique and is unrivalled by any other school subject. It makes the boy thoughtful, critical, and of a discerning judgement—qualities that he will need every day of his life when he enters the world

Utilitarian grounds

History is sought to be put in the curriculum by some on the ground that it teaches morality. But it is now recognized on psychological grounds that History should not be made a pretext for sermons, because of the emergence of the spirit of contrariance in the child after ten or eleven—a spirit that makes him react violently against all exhortations that are inevitably regarded by him as a direct attack on his moral code or conduct. It is best to leave the stories, sincerely and vigorously told, to do their own work. Equally dubious perhaps is the claim that History makes one truly patriotic and gives him a proper civic sense. Though it is possible to handle the History course in such a way as to show our indebtedness to other nations for our glorious heritage (and thus to foster the higher type of patriotism that is not confined to narrow national limits but works for the advancement of the general welfare of mankind) it has in the past engendered the narrow patriotism that says 'My country, right or wrong', and has been the source of incalculable mischief. Again, citizenship is a complex thing and depends on many other factors than the few lessons on Civics that the History course may or may not provide.

Aims at different stages

From the above discussion as to the reasons for teaching History, it is quite clear that the very first aim of the teacher should be to kindle the child's interest in the subject and not to crush him under the dead weight of information 'mugged up' for examination or class purposes. When the child's love for the subject is an undoubted fact, and he has reached the middle forms, the disciplinary aspect of the subject and the habit of right thinking that it engenders, should engage the teacher's attention. Every bit of work the child does, whether in connexion with his oral lessons, writing work, or work in original sources, should be made a valuable aid to the training process

Arrangement of the course

From considerations of the nature of the pupil's mind and interests, the teaching of History in school has generally been divided into three clearly marked stages, differentiated by the material presented and the methods adopted in each. They can be termed the 'early or preparatory stage,' the middle stage, and the senior stage, the first roughly extending from seven or eight up to ten, the second from ten to thirteen or fourteen, and the last from fourteen to sixteen, the usual age at which the average Indian boy sits for the Matriculation or its equivalent examination.

Type of material in syllabus at each stage

Professor Cock suggests that for children in the early stages, say under eleven, the story is the principal thing and should be so vivid and romantic that it would inevitably capture the child's interest.[1] After eleven, the child gets interested in things around him and this is the time for dealing with History with a social bias. Then comes the senior stage when though the social interest remains, there is a general broadening of the mental horizon and deepening of the intellectual interest, and the boy likes to hear about countries and civilizations across the seas, as well as to study the institutions of his own country. These suggestions are not meant to bottle up the child's interest in watertight compartments nor to be followed rigidly, but merely serve as a guide in drawing up the syllabus.

Continuity in syllabus

The child should be given a continuous knowledge of his country's history He should never leave school after having 'done' only the Hindu or the Mohammadan period To achieve this continuity, two methods can be followed: (1) the 'concentric' method——going over the whole of the country's history every year with fuller and fuller detail or from different aspects, e g the customs of the people through the centuries, the army, the navy, religious toleration, the Indian States, self-government and so on. (2) The 'periodic' method—the subject being done during the entire school period in well defined sections for each year A fierce battle has often raged round these rival methods, but it is now recognized that the thing has been overdone, and that the best plan seems to be to effect a compromise between the two by presenting the landmarks of national history (from the coming of the Aryans up to the present day), through carefully chosen stories from the lives of saints, sages, kings, heroes, reformers, etc , in the first or second year of the preparatory stage, and then negotiating the broad facts of national history by the end of the middle stage[2] by combining the 'outlines' method (covering a reasonably long period each year) with the 'periodic' method which would allow an opportunity for intensive study within the larger outline Where necessary, special treatment of a few topics ranging over the entire period can be taken up in place of the intensive study of a short period within the larger outline In the senior stage the arrangement of the matter should be left to the teacher or the brighter boys, provided the work done is of a higher type and not a mere chronological repetition of the facts already learnt.

[1] A A Cock, *The History Lesson.*

[2] As all the universities and school boards in India have not yet included History in the list of compulsory subjects for the two highest classes in school, the course in Indian history ought to be finished by the end of the middle stage, i e. the third highest class

Contents of the curriculum

Three hours in the upper (including one for Civics) and two in the lower classes are now as a rule available in our schools for History So the younger children have at their disposal sixty and the older boys ninety periods of hours in a normal working year of thirty weeks. It is also a happy sign that the number of years available for the study of History has increased in recent years from six to eight. All this has made it possible to widen the curriculum (which has been admittedly much too narrow in this country), to provide a better mental training and to make the study interesting in countless ways.

The story of ancient civilizations

The story of the ancient civilizations of Sumeria, Egypt, Babylon, Phœnicia, India, Greece and Rome should find a place in every scheme of work for a secondary school. It is now recognized that instead of beginning the History course with a plunge into Aryan or pre-Aryan India, it is far more scientific and natural to start with the beginnings of life, man's gradual but romantic development therefrom and after countless vicissitudes and efforts, his achievements in the various theatres of the ancient world In this way the child will have an idea of the continuity of all development, so essential in fostering a proper historical sense and also the idea that India was not the beginning of things So the course, naturally very simple in character, should be begun as early as eight or nine

World History

If we are to follow intelligently what is happening in the world—and regard its problems in the right way, a wider outlook is necessary —in fact an international attitude needs to be cultivated. Of the various devices adopted in secondary schools to further this end, a course in World History appears to be the most fundamental, for it will bring the child a conception of the solidarity of mankind, a social consciousness, irrespective of caste, creed or race, and will lead him to co-operate more easily with peoples whose civilization he has studied and to which he finds himself indebted for many of the things he is proud of The course in World History should be postponed for obvious reasons till the last year or two of the boy's life at school Books that can be followed with advantage at that stage are Wells and Carter, *The Outlines of World History*, R. G Ikin, *The Pageant of History*, or Hoyland, *A Brief History of Civilization*.

European History

Important movements like the Crusades, the Renaissance, the French Revolution, the Risorgimento, etc , will be dealt with briefly in English History and later on emphasized in studying World History, the inclusion of European History would merely overburden the school curriculum.

English History

Much of Indian History, especially from the sixteenth and seventeenth centuries, remains obscure without some rudimentary knowledge of English History. Again, to an Indian student who is being trained to look forward to the citizenship of a self-governing India within the British Empire, the growth of the democratic idea in England and the story of her expansion are matters of absorbing interest. English History should be begun in the middle forms at a time when the boys are approaching (in their study of Indian History) the beginnings of trade relations between England and India. For reasons already given, the course in English History ought to be finished by the end of the middle stage.

In dealing with the subject the Indian teacher should carefully observe certain important principles. Firstly, he should, whenever possible, show the interactions of English history on India and Indian affairs. Secondly, the syllabus must not be made a confused jumble of meaningless names, unintelligible wars, and tortuous policies Thirdly, stress should be laid on the interesting and important personalities whose actions greatly influence the country's history, as also on social life and conditions and the contrast they afford to the present. Fourthly, there should be no elaborate attempt to study the parts of the British Constitution or the administration of justice, etc , but the broad constitutional results, such as the gradual change in the power of the monarchy, the growth in the power of the House of Commons, and the independence of the Law Courts, etc., should be carefully noted. Recent history (from the eighteenth century onwards with its chief characteristics of economic, social, constitutional, political and imperial development) should be studied, not reign by reign, but under such heads as 'The Growth of the Empire', 'The Industrial Revolution', 'Social Reform', 'Cabinet Government', 'Extension of the Franchise', 'The French Revolution and the struggle against Napoleon', etc., or through the lives of such men as were especially concerned with these movements and changes.

Indian History This should be the basis of the course and does not require any discussion.

There should be no separate course in Local History for two reasons. It is difficult to make provision for it in the time-table, neither

Local History are there any suitable books and monographs for children But in the study of national History a good deal of stress should throughout the course be laid not only on the character of the provincial or local celebrities, and on the life of the people at various points of time, but also on the historical remains of all kinds—the visible monuments of the greatness of the past—still found in the child's province, town or village. Not only does the child come to conceive an interest in the antiquities but his ordinary history becomes very much more real to him by being related to his actual experiences Much can be done in this field as is now being done at Bedales School, Petersfield,[1] by extra-school activities through the work of an Archaeological Society under the guidance of the History teacher. The study of a local guide-book or directory with the teacher or by the boys themselves, frequent visits under the teacher's guidance by boys in their spare time to historical places and remains, making of notes, drawings, plans and taking of snaps, discussion of the striking aspects and points of the architecture of the buildings and ruins, as also of the names of streets and places, the collection of the ballads still sung by the common people in the locality and the customs that still prevail—all this will be found extremely useful.

It is now generally recognized that the child should not leave school without some knowledge of the institutions of his country, the

Civics laws and by-laws that regulate the life of the citizen, the people who make them, the people who elect the lawmakers, and the administrative machinery that gives effect to the laws and by-laws and so on. Civics should find a place in the curriculum from the third highest class,

[1] H. A Drummond, *The Teaching of History*

preferably earlier still in an informal way (see second part of this Chapter, pp. 151 seqq)

The suggestions with regard to a History syllabus will be clearer in tabular form :—

CLASS III (8-9 YEARS)

The story of the beginnings of life, of the Primitive Man, of the lives of the people in Sumeria, Babylonia, Egypt, Crete, India, Phœnicia, Greece and Rome Stories of great characters like Sargon, Hammurabi, Hatasu, Minos, Rameses II, Moses, Sennacherib, Budha, Xerxes, Pericles, Alexander, Chandragupta, Hannibal, Asoka, Caesar and Augustus

CLASS IV (9-10 YEARS)

Simple stories from biography (Indian History) from earliest times up to the present day.

CLASS V (10-11 YEARS)

Outlines of Indian History from earliest times to 1206. Special period (327 B C - A D 648)

CLASS VI (11-12 YEARS)

1 Outlines of Indian History (1206-1525) Special period (1321-1338).
2 Stories from English History, earliest times to 1485
3 Civics (fortnightly informal discussion on simple topics)

CLASS VII (12-13 YEARS)

1 Outlines of Indian History (1525-1785) Special period (1556-1707).
2 Stories from English History (1485-1815)
3 Civics (fortnightly or weekly informal discussion on simple topics)

CLASS VIII (13-14 YEARS)

1 Outlines of Indian History (1785-1930) Special treatment of the following topics :—
 (a) The development of Maratha power since 1720 and its relations with the various powers in India The Maratha system of administration
 (b) The foreign relations of British India with special reference to Burma and Afghanistan The North-Western and Eastern Frontiers.
 (c) The development of the Indian Constitution
 (d) Social, educational and industrial changes.
2 Stories from English History (1815-1930).
3 Civics.

CLASS IX (14-15 YEARS)

1 Indian History.
2 Civics
3 World History from the ancient civilizations to the modern era to 1914 (to be done in two years).

CLASS X (15-16 YEARS)

Same as in Class IX.

Oral lessons

Unless 'laboratory' methods are adopted, the oral lesson is the chief means of presentation. The two essential characteristics of a good oral lesson in History are a wise selection of the material and the ability to impart the facts in the most effective way. The second largely depends on the amount of co-operation between the teacher and pupils, the forms of that co-operation naturally varying during the different stages of the boy's development. A teacher with the fundamental requisites in him of a passion for the subject, wide reading, judgement, a knowledge of the capacities and interests of children and an innate feeling of love towards them, would find himself in a position to give the best kind

of oral lesson. If in addition to these fundamentals, he has a sense of humour, a good voice, and is a bit of an actor, his narration, always a strong feature of the History lesson, would be graphic, even dramatic on occasions and would never fail to interest his boys To make the lesson real he needs also considerable powers of drawing and sketching There is another thing which the teacher must not forget. he must always hold the strings of the lesson in his own hands Certain points only will be worked out in co-operation with the class, with regard to others, he must give the necessary explanations and descriptions. He must make up his mind while preparing at home as to the amount of co-operation he will invite from the class.

The early or preparatory stage : presentation

The stories should be told in a vivid graphic manner in the vernacular, observing the chronological order As the children find it very difficult, almost impossible, to remember the whole story if told at a stretch, the teacher should split the story into suitable sections with pauses and recapitulations. Only as much should be narrated as the children can reproduce without difficulty at a time. Discussion, which should be a salient feature of the History lesson at all stages, will be an invaluable aid in clarifying their hazy notions about things After the complete story has been given to the children section by section, they should be asked to recapitulate. Sometimes they may be asked to put questions to the class by way of recapitulation, thus giving them scope for mental activity and directing their instinct of self-importance into a useful channel Another device to refresh their memories about a course of events is the blackboard summary. It should be always with the *co-operation of the children* as the lesson proceeds and not put down at the end of the lesson It should be neat and brief, points and phrases being mainly used instead of full sentences The points should be arranged attractively in a vertical series, i e one below another with proper headings, sub-heads and numerals Occasional sketches with coloured chalk to illustrate points in the summary will be very helpful. A little time should be allowed to the children to get the blackboard summary down in their notebooks No independent notes need be made at this stage. The teacher should here, as in the next two stages, whenever necessary draw sketch maps (with not too many details) on the blackboard to illustrate special points in the lesson. There should be no set examinations It is enough if the boys like to hear and remember the stories. The procedure of oral questioning can be varied by asking the children occasionally to write down in their own words what they have heard or learnt.

Group work

As nothing appeals to young children so strongly as 'active doing', they should be given a good deal of 'expression' or practical work[1] of various kinds to be done in groups[2]—drawing, painting, paper-cutting modelling, map-making, acting, etc. The children will make pictures and sketches in their notebooks of animals, caves,

[1] For the various forms of handwork mentioned here the following will be found very useful: Books A. and B in Nelson's recent publication—The Foundations of History Series and Eva Erleigh, *In the Beginnings* (also Nelson) The Living History Series by Professor Bell (George Philip & Son); Lay, *The Pupil's* [also *The Teacher's*] *Book of Constructive Work*; *Pictorial Education* (Evans Brothers), Lay, *History in Pictures* (Macmillan), Wynne, *Architecture Shown to Children* (Nelson).

[2] The many advantages of group work are well known and need not be discussed here.

dwellings, dolls, ships, buildings, vases, ornaments, furniture, dress, arrows, swords, helmets, chariots, etc., of the various countries about which they are reading. Valuable instructions are given in E. D. Hancock, *The Way to Egypt* (Nelson) as to how children can make a very interesting collection by cutting out of coloured paper simple figures of men, buildings, boats, etc., and pasting them artistically in their notebooks. Modelling in cardboard, wood, clay or plasticine (sticks of plasticine in various colours can be had of all well-known booksellers) is a very pleasant and stimulating occupation for children. A combination of painting and modelling is often necessary to achieve the most satisfactory results. The children will make models of caves in which the cavemen dwelt, their implements, as also those of succeeding ages, pottery of various countries, thrones, temples, pyramids, forts, different styles of architecture, etc., and coming to our own times, of aeroplanes, trenches, and 'tanks'. In imitation of early man, they may also attempt simple methods of spinning and weaving, cooking and bricklaying. As is evident, a good deal of guidance in the initial stages will be necessary from the handwork and art teachers in the school or from the people at home and this should be willingly given.

The Indian child whose dramatic instinct is strong will find representation of scenes and pageants from history as interesting as the dramatization of the events that lend themselves to that sort of treatment, e.g. the meeting of Alexander and Porus, of Rama Pratap and Man Singh, etc. A dramatic representation with some sort of dress representing the times, however inadequate, is better than one without any. The clothes should be improvised by children working in groups. The acting should be extempore at this stage, the teacher being there to help them if they fail.

The children should have copies of outline maps of the world and India in which they will colour countries, provinces, possessions and places as they read about them. The art of making pictorial maps in colours is very well illustrated in E D. Hancock, *Father Time's Tales* (Nelson) and will provide interesting work for the children. The better specimens of the work of the children should decorate the classroom.

The imparting of a sense of time to the young child is admittedly difficult but highly desirable as without some device to convey it, the child cannot develop a proper perspective of chronological sequence, especially in the preparatory stage when large sweeps of time are covered by the stories and biographies. The picture-chart is very convenient in indicating the passage of time by pictorial representation of the characteristic things, achievements, and outstanding personalities of various countries or of the same country at various points of time[1] These pictures should be drawn by children in groups and the best specimens hung on the walls of the classroom.

Pictures

Large-sized wall-pictures (very often enlargements by the teacher or the older boys) should preferably be used and there should be a lot of discussion (not only at this stage but also at the next two) on the pictures presented so that every ounce of value may be extracted from them.

In the lowest form (8-9 years) no textbook is necessary, especially if the child is making up his own picture-book of the different activities of the

[1] See *Britain and Her Neighbours III The Beginnings* (Blackie & Son), for a model

ancient world. However, it may not be very wise to depend entirely on the teacher or the children's own efforts So a very simple and attractive textbook in the vernacular on the lines of Mrs. Erleigh's *In the Beginning* should be prescribed The textbook both here and the next higher stage should be entertainingly written, be historically accurate, and full of good illustrations, preferably reproductions of old prints, and provided with a few carefully prepared maps with only the countries and places mentioned in the stories.

Textbooks

History teaching in the middle forms presents a good deal of difference from the preparatory stage Here the pupils are to have a solid grounding in the facts of Indian History, to know in story form the principal landmarks of English History, to make their acquaintance with Civics, as well as to acquire more definite notions of chronology and of history as being a continuous development of cause and effect and, in the higher forms, to receive training in historical thinking mainly through work in the original sources They are now eleven or twelve and getting past the stage at which stories alone will please.

The middle stage

Not only should the ideas presented be absolutely clear and vivid to the children, but there should be no impediment in their expression. Hence, to avoid the mistakes of the past, it is necessary that the medium of instruction throughout this stage should be the vernacular and the boys be allowed to express themselves in their mother-tongue.

Medium of instruction

Every child should possess a copy of the textbook written along the lines already suggested. In the higher forms of the middle stage if it is found that the boys can read and understand English freely, a suitable textbook in English written in a very simple style may be prescribed. The individual possession of a textbook is vital, as without it, no revision work can be of any value

Textbook

From this stage, History should be studied mainly as movements, though biography and episodes will be fitted into their proper places. The biographical method cannot be continued too long as it tends to a loss of perspective and balance, by giving one a very inadequate sense of time or of continuity in History and by failing to show adequately the underlying forces of the different ages that are moulding or disintegrating the lives of the people. Treatment in 'movements' is far more difficult than the simple biographical method as it involves individual initiative in careful arrangement and planning, judicious selection and insight into cause and effect. But it is well worth attempting as it is certainly more interesting and educative.

Studied as movements

The teacher generally in the middle stage either asks boys to read portions of the textbook at home, asks questions on the subject in the class and explains the difficulties of the boys, or he asks the boys, one after another, to read portions of the textbook in the class and explains the verbal and other difficulties. Both these methods are wasteful, barren and uninteresting, apart from the great objection that no textbook follows exactly the lines one wants There are again some teachers who will have none of this inertia and lethargy, now there is a swing of the pendulum: they go on haranguing the children as if they are mere passive

Presentation

receptacles of knowledge. The best plan seems to be that the teacher should break fresh ground in the class and proceed by narrative and questioning (with regard to each section of the lesson), never forgetting, as has been already pointed out, that the children's active participation in the lesson is what largely ensures its success. As he goes on with the lesson he will pass lightly over certain parts, emphasize certain others by careful treatment, will introduce much illustrative and explanatory matter, use the blackboard for sketch-maps to illustrate special points in the lesson and for diagrams of battles, buildings, etc, as also for putting down the heads into which the lesson is divided and developing a brief summary[1] under each (as the lesson proceeds). He must also, whenever he finds an opportunity, show the development of historical events through cause and effect, and the vital relation between the past and the present, partly by his own exposition and better still, by leading the pupils by skilful questions to discover and state them for themselves. He should use a Line of Time, or Time-chart, reproductions of pictures, coins, and other historical objects to give definiteness to ideas and to make the study a vivid reality.

Testing of knowledge

Besides asking a few questions at the end of each section (which will be necessarily longer here than in the previous stage), there should be some testing of the knowledge gained at the end of the lesson. Haphazard questioning of the boys, particularly if the class is large, is of very little value The questions should be so employed as to build through the boys' answers their knowledge into a systematic whole. Thus when a series of intelligent questions has been carefully prepared beforehand and is so designed as to lead from point to point, when a pupil is encouraged to state all he knows without interruption and when, after he has given his answer, other members of the class add to and amend his answer, the result is far more satisfactory. A hint may be added: ordinarily to ask for names and dates is less useful than to ask for a description of an individual character in history or for an explanation of why the character acted as he did on a given occasion.[2] The teacher should dictate to the children at the end of each lesson a few carefully prepared questions for which they have to find answers while revising at home. These questions would focus the child's attention on the salient points in the lesson and recall to him the teacher's treatment of the matter. At the beginning of the next lesson the teacher should go over the questions dictated to the boys to find out whether the boys have honestly prepared the old lesson and whether they are ready for new work. He might vary the procedure by occasionally setting a few questions to which the children have to write brief answers in exercise books.

Literature

The teacher should link up the History lesson with literature from this stage. Almost all the provinces in India have at the present day poets who have written on historical subjects. The Bengali child is especially fortunate in having a whole host of brilliant writers who have dealt with historical themes in the vernacular, some of the work of Nobin Chandra, Hem Chandra, J. N. Bose, Rabindranath Tagore

[1] If the boys have been trained in the art of note-making no 'summaries' will be necessary from this stage See below p 133 'Note-taking and Note-making'.

[2] See the *Memorandum on the Teaching of History*.

being essentially suited for utilization in the classroom. There are also now available fairly good editions of local ballads. Acland's *Ballads of the Marathas*, and the *Ballads of Eastern Bengal* and of the Murshidabad District (that give us such illuminating glimpses of social life in Mughal India) are highly useful. Seshadri's *Anthology of Indian Historical Verse* has some fine poems There is an anthology of high-class English verse written by Bengalis (compiled by T. D. Dunn and with a foreword by Tagore) which can also be pressed into service in the higher forms. Arnold's *Light of Asia* is a well-known general favourite. A painstaking teacher will not lack material if he will only look for it. With regard to English History, there is no difficulty in finding suitable material as there are good collections of historical poems for school use, like those of E. Pertwee and C. H. Firth and the volumes published by Bell. The value of poetry in connexion with the History lesson is not only in giving atmosphere, it is also highly practical inasmuch as much revision work can be done very pleasantly through it, and the boys can be set the stimulating exercise of finding out incidents and facts therein that are not supported by authentic historical data. Another very useful device in History teaching is to ask the boys to express some of their history work in verse form. It has been successfully tried with boys of thirteen to fourteen by Mr F. C. Happold at the Perse School, Cambridge, and at a few other schools.

Types of individual work

In asking the boys to do individual work one salutary principle should always be remembered, viz. that the exercises should not be so numerous or arduous that they will entail working at home late at night.

1. Sources

The boys should from this stage be given some work in the original sources of Indian History (translated of course into the vernacular for the lower forms). Although good source-books for English History (with problems and exercises) are easily available, unfortunately there are few for Indian History.[1] But an industrious teacher can find out suitable extracts from the original sources themselves or from books like the *Student's Source-book of Indian History* by H. L. O Garrett (Cooper) and *New Readings from Indian History* by W H. Hutton (Cooper), set appropriate problems and exercises thereon, and then use them with his class. The method of treatment will be detailed in a later section.

2. Optional reading

The boys should be encouraged to read at home suitable monographs, biographies, novels and dramas of which there should be a fair stock in each classroom library (which should be a separate thing from the general school library). There is a fair amount of historical literature written at the present day for boys and girls in the middle school and this optional reading should prove a source of great profit and interest to them Every boy in the class need not read the same book The selection of books should depend on his particular bent or interest. The teacher should give the boys one or two questions on the books selected so that the reading may not be aimless or desultory. These questions might be neatly and briefly answered in their exercise- or note-books for the teacher's examination.

[1] There is one in preparation by the author of the present article.

3. Essay work

The boys should be given an essay to write once a fortnight in the middle school and once a week in the senior stage. The essays should be of different kinds to suit the different needs of groups in the class and always of a thought-provoking nature, never of a purely reproductive or rambling type.

Occasionally in the middle school essays should be given on subjects which are quite new and every part of which the child has to work up. This can be a most valuable training especially if there is a good classroom library of suitable books. For seniors much of the work done is to be of this original kind.

4. Practical work

Practical work includes the making of maps, pictures, charts, models, etc. This is far more interesting and educative when done in groups.

5. Monthly test

Besides the essay work, there should be a *short* monthly test (say for thirty or forty-five minutes) on what the child has done during the month. It is of great use as it enables both teacher and pupil to see whether the facts of the reading are really known.

6. Note-making, note-taking and notebooks

A distinction has been drawn between note-taking, where the teacher dictates the note or writes it on the blackboard for the children to take down, and note-making, where the boy does most of the work for himself. Dictated summaries or answers to probable examination questions, such common features in the History classroom in India, are worse than useless and should be tabooed. They are often taken down incorrectly by the boys and kept in a most untidy manner and serve no purpose except that of unintelligent memorizing. Of course this general ban does not rule out the occasional dictation of notes serving as good models to *junior forms*, but it should be a recognized principle that the upper and middle forms should always make their own notes, and the boys in junior forms should begin to receive a training in the art of intelligent note-making as early as nine or ten. It is highly desirable that intelligent note-making should take the place of blackboard summaries from the middle stage onwards.

In the initial stages a good deal of help will have to come from the teacher and he must be patient. Illustrations may be frequently used instead of mere words. If, for instance, notes were wanted on the life of the early Rajputs, headings such as (1) their Country, (2) Weapons and Armour, (3) Costumes, (4) Love of the Hunt, etc., would be given and appropriate illustrations, with a few words in explanation of each, would then be drawn As a development of this procedure, children will be asked to write a few remarks round important points as they are dealt with in the lesson or in the reading. Thus, in a lesson on the Mughal Conquest of India, one of the most important things for the class to get down somewhere in their notebooks is a list of the effects of that conquest. Mere pictures which could perhaps give an idea of the life of the times, would fail to deal adequately with this particular question. So the younger children should be given, on the blackboard, the main heading 'The Results of the Mughal Conquest,' and then the sub-headings (1) On the Afghans, (2) On the Rajputs, (3) On the other Hindus, (4) On the Land, (5) On Gardening, (6) On Architecture, (7) On Painting, etc., the children writing the results in their own words. The children are not only to make

their own notes under each heading from what they hear in class but also from their private reading at home on the same topics Frequent examination of the children's notebooks is necessary at this stage and the teacher should help the more backward ones as much as his or her time allows.

It is a good rule to insist that the notes and the questions dictated at the end of the lesson should be confined to the right-hand side of the notebook On *the left-hand side*, the boys should enter *in their proper places*, diagrams, pictures, battle-plans, maps, stories, quotations from historians (especially when they contradict one another), ballads, poems, suitable extracts from the sources, gleanings from historical novels, analogies from other events and all the *disjecta membra* which they will combine in their essays later on. This arrangement will leave undisturbed the thread of the main body of the notes on the right and give the boys a chance of collecting a lot of interesting and useful material

They should also have a Line of Time for the years, say 1000 B C. to the present time, pasted at the back of their notebooks and filled in as the History teaching proceeds and also a shorter Line of Time on the left-hand side covering the events done in a dozen or half a dozen lessons. Its place in time can easily be fixed by referring it to the larger Line of Time at the end.

Co-operative work : 1. Lectures, discussions, and debates by boys

The teacher occasionally at this stage, but more frequently in the next, may ask the class to prepare a subject, say Babur, the different groups in the class taking up different aspects of his life and character. Each group works up the particular division of the topic from reference and general books which they have been taught to handle by the teacher through use of the index. It then selects its spokesman who gives to the class the information gathered in the most interesting way in five to ten minutes (for boys of ten to fourteen). The scheme was found highly successful at the Perse School, Cambridge, and Caldwell Cook gives the Littleman Lecture a prominent place in his Play Way methods of teaching History.

Discussions on historical topics should form an important feature of the work at this and the next higher stage. Boys will be encouraged to take sides in controversial questions, though not blindly, to discuss historical problems as naturally as they would their own, and to enter as intimately as possible into the spirit of the times. Classroom debates on thought-provoking subjects such as ' Would India have been better off if the Mughals did not come ? ', ' Was the intolerance of Aurangjeb the cause of the downfall of the Mughal Empire ? ', etc., etc., would prove highly interesting and the boys and girls will willingly undertake the trouble of getting up the facts.

2. Drama and Handwork

Drama and Handwork will not be such prominent features at this stage, as they were at the earlier, though dramatization has been found to be of great use at the Perse School in giving expression to the oncoming emotions of the adolescent. At this stage, the words of the dramatic piece must not be extempore but should be definitely found by the boys, as also the clothes.

With regard to Handwork, though modelling will not be done so extensively as in the earlier stage, yet boys will find it still interesting in the carpentry class to make a rough model of the Peacock Throne (with the proper measurements) or the Mughal Audience Hall in miniature, i e anything the

construction of which is fairly simple. Of course there will be a lot of picture-making which will include reproductions of drawings, paintings, sketches and photographs

The making of Time-charts and maps which will continue into the next higher stage will be dealt with in the section on ' Apparatus and Appliances '.

3. Excursions and expeditions

Expeditions under the teacher's guidance to museums, ruins, and other places of historical interest, especially those connected with local history, should from time to time be undertaken and each group is to study some particular aspect of the thing that is visited, the whole thing being rounded off by a discussion in class.

The senior stage

From the foregoing discussion, it will be evident that the work at this stage would not present such a marked contrast from the middle stage as the latter did from the preparatory.

Textbook

Their knowledge of English having increased by this time, the textbooks may be in English provided they satisfy the requisites in a good standard book. The universities and school boards allow students to write their answers in the vernacular at the final examination, so if some or all the boys desire a textbook in the vernacular, they should have it.

Mode of study

The study of History will not only be continued largely as movements and developments but the senior students will be made to work on a particular movement or its development in some detail and encouraged to pursue special interests of their own—always the mark of all advanced work—e.g. Mughal art, the influence of the faith movement on Islam, the social reformers, etc. Topics with a constitutional and commercial bias should also be prominent features of the study.

Teachers' procedure in class

The teacher may at this stage set a portion or portions (longer if the book be in the vernacular) of the textbook to be read at home with questions to direct the attention of the boys to the important things. In class he may discuss the really difficult points in their reading. He may also occasionally set a problem and ask the boys to find out an answer to it *in class* by going through certain specified paragraphs or pages in the textbook There may be occasionally also a lecture on an important topic followed by a real discussion or debate. Save in these respects the teacher's procedure will be more or less the same as in the middle stage, though pictorial aid will hardly be necessary, if not entirely dropped

In individual work, historical literature, novels and monographs will be more often studied There will be more difficult types of exercises on the original sources and weekly essays on new subjects will be worked up entirely by the boys themselves. There should also be a greater volume of notes from private reading as well as from lessons in the classroom.

In co-operative work, discussions and debates in class will be the main feature of the work. The Littleman Lecture will give place to talks and papers by the leaders of the groups (age fourteen to sixteen) for a longer time dealing with some theme or topic in a fairly comprehensive manner and certainly in a more advanced way. With the passing of the age of make-believe, dramatization will not be such a useful device, though dramatic readings by groups or the class will constitute an important feature of the

work. In handwork, modelling and picture-making may be dropped, making of maps and Lines of Time will still be useful. Excursions and expeditions should be continued.

The source method

Broadly speaking, the sources include, so far as the school is concerned, not only contemporary documents but also the writings of the great historians.

The method is worth trying for various reasons. The sources vitalize history to the child by giving him the associations and atmosphere of the past; they impress him as being the raw material from which history is written, they offer him opportunities of mental training of a highly desirable kind through exercises in reasoning and judgement, a training which is very difficult to have from the pages of a textbook in which the subject matter has already been sifted and judged by the writer.

As Dr. Keatinge points out, the original sources may be mainly used in two ways, (1) as giving atmosphere, especially in the lower forms, (2) as exercises, in the upper and middle forms. Whichever way an extract is used, it must be in the hands of the child and read and re-read carefully, though occasionally, purely for purposes of atmosphere, reading by the teacher for a couple of times in a clear voice might be sufficient provided the document is of a very simple character In default of a sourcebook, cyclostyled copies of the extracts may be given to the child or the extracts put clearly on the blackboard to be copied by the boys on the left-hand side of their notebooks

Let us first consider their use as atmosphere Very little need be said on this as it is almost self-evident. It is easier for boys for example to realize the atmosphere of nervousness that benumbed Alexander's soldiers and to get an insight into the real reasons for his abandonment of the Indian campaign when they read Plutarch's account of the reports that reached the Greek camp of the vast army lying in wait at Pataliputra. Instances can be multiplied but it is really not necessary It should be always understood that one or two suitable questions should be attached to the extract to bring out the salient points in it.

In dealing with the use of the sources as exercises (which should not be begun before eleven or twelve), some instruction needs be given to the boys as to the value of the documents. As a very first duty they should be told to find out (if it is not given) the writer of the document or particulars about him from the internal evidence and then to ascertain its value. They should know that the account given by a non-party man is valuable because it is likely to be unbiased, that a chronicle is important if it is contemporary or written not too long after the events, or if it is written near the centre of things viz. at Pataliputra, Delhi, Agra, Calcutta, etc.—when instruction of this type is given to the boys and they have had some experience in judging the value of the sources, they are not only able to collect, examine and correlate the facts, but also to compare and rationalize different conflicting accounts of characters and events It should also be remembered that the exercises to begin with must be fairly simple and should be graded in difficulty as time goes on. Long answers to questions on the extracts should generally be discouraged. To achieve the most satisfactory results, some practice ought to be given at the initial stages in the method of short answers. I have used the source method with the Ballygunge Government Demonstration School

boys and found the results beyond my expectations. A few of the actual exercises used are given below.

EXERCISES

1 The following extract gives an exercise in the collection of material facts from a document and in simple inference and incidentally leads to the discovery of an interesting piece of knowledge

Conditions. The class is working at the Maurjya period

Extract. Some teachers say that, of armies composed of Brahmans, Kshatriyas, Vaisyas, and Sudras, the first is better than the second, the second than the third, and the third than the fourth, in regard to bravery 'No,' says Kautilya, 'the enemy may win over the army of Brahmans by submission and prostration. An army of Kshatriyas is to be preferred for their training and skill in the use of arms, or an army of Vaisyas or Sudras for their great numbers' (Kautilya, *Arthasastra*)

Exercise. Read the extract carefully and state with your reasons (a) the time to which the extract refers. (b) Who were the fighting classes then. (c) Which was the best fighting class in point of skill and training (d) What were the defects and strong points of the other fighting classes

The points that a boy may reasonably be expected to get hold of are the following :[1]

(i) The extract refers to the time of Chandragupta *Kautilya wrote in his book about the conditions in Chandragupta's reign*

(ii) The fighting classes then were the Brahmans, Kshatriyas, Vaisyas, and Sudras *Reference throughout the extract to these four classes*

(iii) The Kshatriyas were the best fighting class from the point of view of skill and training An army of Kshatriyas . . use of arms.

(iv) The Brahmans were perhaps quite good warriors but they were too soft-hearted *Some teachers say . . . than the second The enemy may win over the army of the Brahmans by submission and prostration*

The Vaisyas and Sudras had the largest numbers but they were not so skilled in the use of arms as the Kshatriyas and Brahmans *An army of Kshatriyas . . for their great numbers*

The exercise might be profitably followed by a discussion with the class as to when the Brahmans ceased to be a fighting class and for what reasons

2 The next problem compels the boys to consider character closely and at the same time lends itself to a revision of back-work. As the possible points from boys' answers occupy much space, only the extracts and exercises will be given henceforth.

Conditions. The class has done the War of Succession in Shah Jahan's reign and is acquainted with the features of the characters of the four Princes.

Extract. The Emperor Shah Jahan used to say 'At times I fear that my eldest son (Dara Shikoh) has become the enemy of good men. Murad Bakhsh has set his heart on drinking; Mahammad Shuja has no good trait except contentment (i.e. easy good nature) But the resolution and intelligence of Aurangzeb prove that he alone can shoulder this difficult task (viz ruling India) But there is great sickness and infirmity in his physical frame. (*Ahkam-i-Alamgir*, ascribed to Hamid-ud-din Khan Bahadur)

Exercise What do you think of this estimate? Mention whatever facts you can in support of your answer.

3. This exercise needs very close study and calls for careful inferences from the data collected as a result of the reading.

Conditions The class is studying Harsha's reign and knows about the university of Nalanda

Extract To Nalanda come students from all over India from the distance of 10,000 li The priests, to the number of several thousands, are men of the highest ability and talent Their distinction is very great at the present time, and there are many hundreds whose fame has rapidly spread through distant regions. Their conduct is pure and unblamable They follow in sincerity the precepts of the moral law The countries of India respect them and follow them The day is not sufficient for asking and answering questions

[1] Results noted as possible have been given to the writer by the boys of the Ballygunge Demonstration School, Calcutta It is obvious some preliminary training is necessary before such exercises will be effectively tackled.

Exercise. Read the extract carefully and write down all you can about the author from the internal evidence

4. The following exercise is of a more difficult nature It is intended to show that accounts of events or characters, especially if they are of a conflicting nature, afford abundant opportunities for comparison of clashing testimony and sifting the truth therefrom, especially when there is corroborative evidence from a neutral source

Conditions The class knows both versions of the murder of Afzal Khan (1659)

Extracts (a) Gopinath learnt by a liberal use of bribes that Afzal's officers were convinced that he had so arranged matters that Shiva (Shivaji) would be arrested at the interview as he was too cunning to be caught by open fight (Sabhasad, a marathi and a contemporary of Shivaji, who wrote from memory in 1694)

(b) All the five men with their leader, Shivaji, wore coats of mail beneath their clothes. This precaution was not adopted by Afzal Khan and his five men, nor did they suspect the treachery about to be practised on them (Manucci, a Venetian who came to Delhi in 1656 and wrote in 1699-1700 He was in touch with the Mughal court, for some years being the physician of Auranzeb's son, Shah Alam.)

(c) Sharp son of the Devil ! For trickery and perfidy there is none to compare with him (Shivaji). (Kafi Khan who wrote in 1735 the history of Aurangzeb's reign)

(d) Afzal Khan was instructed by his Government to secure Shivaji by pretending friendship with him as he could not be resisted by armed strength. The latter learning of the design, made the intended treachery recoil on the Khan's head (Rajapur (English Factory) letter, dated 10 October 1659)

Exercise. Read the extracts carefully and state with your reasons who, Shivaji or Afzal Khan, could be accused of bad faith in the beginning

Limit of space forbids the multiplication of these extracts and exercises. Enough has been said I think to establish beyond doubt that this sort of work not only is a good training in reasoning and judgement but introduces an element of variety into the work and gives the student, in a certain measure, the joy of discovering new things and an insight into the art of reconstructing the past from available data. It should be a regular feature of the work, and ought to be taken up at least once a month and should be confined generally to Indian History. It is for these various reasons that the source-method is recognized as one of the advanced Play Way methods, found so effective in schools like the Perse and Bedales.

Laboratory methods

Of the other Play Way methods, the laboratory methods are very important. Up till now the teaching of History has been discussed in this chapter on the 'class' basis, with, of course, stress on individual work and co-operative effort. History, as well as other subjects, is taught to-day by laboratory methods in various countries, more especially in America, always the pioneer in educational experimenting. The strictly laboratory methods divide the time-table into two parts: (1) the individual work done by the boys of the class and (2) the oral lesson, (1) always predominating and almost eliminating (2) which is not so much a lesson as a meeting of the class and the teacher once a week for purposes of arrangements and discussion of the work already done by the boys.

Of laboratory methods, the Dalton plan has been most widely accepted. The usual features and the great merits of the plan are well known and do not require any detailed treatment here [1]

The difficulties of the method, especially with regard to History, are obvious in a country like India, where the standard History books, monographs and other reference books are largely written in a foreign language,

[1] See above Chapter 4, p 55

e g English, where the teachers often lack sufficient knowledge to plan good assignments, where the child, hardly ever taught to stand on his own legs, has not developed a sense of responsibility, where the vicious system of private tutors reduces to nil the chances of individual effort, where the guardians look askance at these 'freak' methods, designed (so they think) to give the teacher a good time and where, last but not least, the planning of assignments, the correction of test papers, the continual presence in the laboratory or subject room, the recording of graphs and charts, etc., throw too great a burden on an inadequate and ill-paid staff. It is perhaps for these reasons that Indian schools have found the unadulterated Dalton plan (in History) hopelessly unsuccessful unless combined with the group or class system. In Bengal, the Hindu School in Calcutta and the Torkona H.E. School in Burdwan have found the results quite satisfactory after combining the laboratory and class systems. Even in England, where the difficulties mentioned above are almost absent, the schools have modified the Dalton plan by introducing the class system for part of the time available while maintaining intact the other essentials of the scheme. However much the boys can achieve through their own efforts, the intimate contact with the far superior mind of the teacher and his higher enthusiasm—so healthy a factor of the class system—are always sources of great inspiration and enlightenment to the young. Generally in the middle stage (in the upper grades of which the laboratory work is usually begun) the time devoted to group lessons should not exceed one-third of the total time allotted to the subject, i e. 20 to 30 minutes in a total of 120 minutes per week ; in the higher stage, it will be necessarily less. The oral lesson will be found very useful if it deals with the more difficult points in the assignments.

The assignments should be entirely flexible, and capable of being modified to suit different levels of intelligence in the class. It may even be necessary to recommend different textbooks for the different groups or sections.

The adoption of laboratory methods in a modified way and for certain forms and subjects will not mean wholesale changes in the time-table and is well worth a trial.

Apparatus and appliances : maps

The History teacher should accept this as an axiomatic truth : that every History lesson wherein geographical ideas are at all prominent, should be illustrated by the map, political or physical. The ordinary political maps, much too general in character and with too many unnecessary details, are of very little use, apart from the great objection on the score of chronology. The maps should be especially designed for a particular event, reign or period, containing amidst other important general features, especially those that are relevant and vital. But wall-maps and charts are not enough. Every boy must have a personal copy of an atlas of Indian History. There is no lack of good historical atlases for English History.

But as it cannot be expected that the maps in atlases or textbooks will exhaust all possible geographical points that may crop up in a lesson, the teacher should have facility in rapidly drawing sketch-maps on the black-board, illustrating the special points of interest and difficulty and impart his skill to the boys as soon as their hands have got set by doing maps by tracing.

When boys in the middle and senior stages are asked to work in small groups, it is more interesting for them to do a set of maps illustrating a particular movement or development. Thus one group could work, with a view to decorate the classroom or the subject-room, on the growth and decline of early Mohammadan Power from A.D. 1000 to A D. 1525, another on the development and decline of the Mughal Empire, a third on the development of the British power in India at various points of time like 1740, 1765, 1785, 1823, 1856, 1888 and 1930, a fourth on the British Empire at these points to serve as a comparison and contrast, and a fifth on the development of trade routes between India and Europe.

Pictures

The value of pictures and portraits is to concretize history, i.e. to make boys realize that history is concerned with real events, places and persons. Hence the fundamental thing is that these pictures, etc., should, as far as possible, be authentic and should reproduce the atmosphere of the times or at least bring back a flavour of the times that they represent. There are plenty of good pictures of ancient history to be found in textbooks and readers They should be enlarged by the teacher or pupils.

Indian History presents considerable difficulty as there are very few authentic pictures till the coming of the Mughals. For the pre-Mohammadan period, we have scattered in various textbooks small-sized pictures of Buddha, Alexander, Asoka, Kanisksha, Harsha (enlarged from a coin in his reign), some of the Ajanta Frescoes, a few samples of the early Rajput painting and pictures of some of the famous temples and buildings After the coming of the Mughals, we have got a large number of authentic pictures in standard books and memoirs, in museums and galleries. The British Museum reprints (postcards) are very useful for the Mughal period. The painstaking teacher should be able to get his collection of pictures with the co-operation of a group of artistically minded boys, not merely by making them copy or enlarge the old prints but by helping them from time to time to reconstruct scenes from the past by referring them to standard books for information as to the details of dress, armour, etc [1] There are few wall-pictures of Indian History actually published at the present time Hence it is still more imperative that the teacher should get his own collection

Some of the finely illustrated pamphlets and booklets published by the Publicity Departments of the various Indian State Railways are also of great help to the teacher. Magazines, periodicals, and weeklies like *The Modern Review*, *Bharatvarsha*, *Indian Art* and the *Illustrated Times of India* are very useful in furnishing the school with reprints of authentic historical pictures—pictures of people, ornaments, weapons, temples, buildings, and other historical relics of different periods. Picture postcards representing the historic buildings in India from ancient times up to the present are published by some very good firms and are extremely helpful in making clear the different styles of architecture and bringing home to boys their special points of beauty and strength.

A lantern or an epidiascope (which enlarges an ordinary picture to ten or twenty times its size and can be easily worked during class hours) is an extremely useful device for showing pictures to a number of boys

[1] This is done every year at the David Hare Training College, Calcutta.

simultaneously. Occasional lectures illustrated by the lantern or the epidiascope can be made a very interesting feature of the course.

Coins

Coins should be used only when they serve as useful illustrations or as atmosphere. Objects that come up to us direct from the past affect the children's imagination very powerfully. It should be remembered that unless they are of any real use, they should not be paraded before the class merely from an antiquarian interest. Replicas of historical coins can be had at very reasonable prices from the British Museum, London, the Provincial Museum, Lucknow, and the archaeological Museum, Muttra. The teacher can easily select the useful ones from the catalogues and get them for the subject room.

Time-charts

Time-charts are an attempt to make time relations intelligible as space relations so that they can be visualized and more easily remembered than dry lists of dates. They also avert confusion by establishing the connexions in time between events that in ordinary circumstances have to be treated separately. A glance at a Line of Time makes the child realize at once that Shivaji was born the same year that Shah Jahan came to the throne or that the Battle of Wandwash and the third battle of Panipat were fought within a year of each other.

In constructing Time-charts certain principles should be observed .—

1. They should represent only space relations.
2. The scale should be uniform and the spacing out absolutely correct
3. They should be of a shape and colour that will readily attract the attention of the boys. Chalk or crayon of different colours should be used to indicate different periods, e.g. the Hindu, Buddhist, early Mohammadan, the Mughal and the British, indicating the various influences under which the country has come
4. They should only have important dates and events (in block letters) without details, i e. only the landmarks which call up other events.
5. They should never be crowded.

Time-charts are of various types. Besides the pictorial charts the 'Stairs' are also useful for the very young.[1] The Line of Time is the simplest and most effective of these charts. While discussing the student's notebook, hints have been given as to the use boys can make of a longer Line of Time with a shorter section of it covering the leading events in half a dozen lessons. The device consists of a thick line, say 2 inches thick, marked off in equal sections to represent centuries. If 1½ inches be given to 100 years, a strip of paper 45 inches long would suffice for the years 1000 B.C. up to the present time and when folded into convenient sections would not be too long for the notebook. Another form of the Time-chart, useful when the events occur in different parts of the country nearly at the same time and the actors on the stage are fairly large in number, is in parallel columns, thus avoiding overcrowding at certain points in the Line of Time. The number of columns must not be too many, three being the maximum that children can take in at a glance. If there are more, the children fail to grasp the fact that all the events in the same horizontal line are contemporaneous.

Examples of the important types of the Line of Time are given (in ordinary print) at the end of this chapter (Appendix A).

[1] See *Highroads of History*, Series No 1 (Nelson) for a specimen

It has already been seen that History can be correlated to a certain extent with Geography and Literature and to a far greater degree, with Handwork. This correlation will be of an infinitely superior type and be certainly more effective if all the teachers in the school prepare their programmes of work during December and discuss at what points each subject-teacher could incidentally help the History teacher during the ensuing year. This has been found most successful wherever it has been tried

Correlation

There should be a History Club *for the whole school* with office-bearers elected by the boys from amongst themselves and with the History teacher as the ex-officio President The functions of the History Club can be numerous. Only a few are indicated here. It should organize national days such as the Asoka Day, the Vikramaditya Day, the Rana Pratap Day, the Akbar Day, etc , when songs suited to the occasion will be sung, speeches made touching on the greatness of the national hero, and anecdotes recited concerning his life and character.

The History club

The History Club ought to have occasional papers on historical subjects written by the older boys, thereby putting a premium on independent study and thought as well as affording opportunities for debate and discussion. A few well-chosen debates in addition to the classroom ones, will add to the usefulness of the club The writing of historical poems and ballads should be encouraged and the best ones might be given a place in School Record of Historical Verse. The club should also organize occasional lectures (illustrated by slides) given to the school by a prominent outsider or the teacher or one of the brighter boys. Excursions and dramatics on an ambitious scale may also be undertaken once a year by the club.

The improvements with regard to methods that have been suggested will be to a great extent nullified if the History examination continues to be the same dull, dreary thing of the olden days. A History paper, be it of the university or the school, should not aim mainly, as it now does, at testing mere memory. Of course a portion of every History paper should consist of questions that are mere fact, date, genealogy and sequence questions This should be compulsory and only a moderate number of marks assigned to it ,[1] but the bulk of the marks should be given to and the position of the candidate decided by questions of a different type, intended to test their skill in certain forms of handwork, their reasoning power, intelligence and ingenuity, and to ensure (as far as examinations can ensure this) that the boys should be taught in a particular way. So a proper History paper (for the middle and senior forms) should include the following features

The History examination

	Marks
1. Questions involving knowledge of facts mainly	30
2 Questions on the drawing of sketches of battle plans, maps, etc.	20
3 Questions involving general intelligence in the use of facts—the essay type	25
4 An exercise on the original sources and a question involving the knowledge of historical novels, poems, etc.	25
	100

[1] See Keatinge, M W , *Studies in the Teaching of History*

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APPENDIX A

1 The Line of Time
2 Extract from The Line of Time. } See folded insets.
3 Time-Chart.

APPENDIX B

OUTLINE OF AN ORAL HISTORY LESSON

The lesson is on Alexander's Invasion of India, the period before that time having already been studied The matter is here arranged under the actual points to be brought out, the main thing being the meeting of Alexander and Porus. The age of the class is twelve to thirteen

ALEXANDER'S INVASION OF INDIA

1 *Introduction*

First point: Who was Alexander ? Where is Macedon, Greece ? (Boys should point out these on a political map of the ancient world)

Second point · His appearance Show picture (enlarged from V Smith's *Oxford History of India*) Discussion with the class.

Third point . His early life, mainly given by teacher

Fourth point His ideas, especially those on world conquest Short extract from Plutarch's *Lives* discussed.

Fifth point: His conquests previous to his coming to India mainly given by the teacher Crossing of the Hindu Kush, 327 B C , occupation of Kabul Reference to the world map, to an Indian historical map and the Line of Time. Let the boys point out the various countries and places and the route of Alexander's march

2 *The Invasion*

First point · What was the state of the Punjab when Alexander crossed the Indus at Ohind ? (Map) Why did not the King of Taxila oppose Alexander ? Who was Porus ? His kingdom ? (Map)

Second point: Porus' appearance. Present picture enlarged from the Porus medals. Discussion of the picture

Third point: Original position of the armies What was the relative strength and equipment of the armies? (The class is asked to make notes under this heading.) Where, and how did Alexander cross the Jhelum? Develop with the help of the class a coloured battleplan on the blackboard Discussion with class.

Fourth point: The actual meeting of the two armies (Battle plan) How did the fight go? What tactics did Alexander adopt? A description of the battle to be given by the teacher. How did Porus acquit himself? What were the causes of the defeat? (The class to make notes)

Fifth point: The results of the battle—partly given by class and supplemented by teacher Class make notes

Sixth point: The captive Porus before Alexander. Show a coloured picture of the meeting of the two kings (published in the monthly magazine *Bharatharsha*) Let the class interpret the feelings of the two great heroes from the picture The new relations between Alexander and Porus given by the teacher (Notes by class)

Seventh point: How far did Alexander advance eastwards after defeating Porus? (Map) Reluctance of his soldiers—reasons—extract from Plutarch discussed with class Building of the twelve altars, Alexander's return and death in Babylon—dealt with by teacher Class to show the route of return journey on the map. Show a picture of the dying Alexander (Uffizi Palace, Florence) Let class fill up the Line of Time with date of Alexander's death.

Eighth point: Give an expressional reading of J Bose's dramatic poem, 'Pruraj and Sikander'. Ask class whether the author has been able to put the life-touch into it Tell boys they are to act the piece in costume Invite from the class dramatization of the meeting of the two kings (in prose). Selection of groups who would take charge of the different items in the supply of dramatic property, e g. Alexander's dress, Porus' dress, Greek helmet, etc, etc.

Ninth point: Dictate the following questions (to be taken in the boy's notebooks); questions (b) and (c) to be answered briefly and orally at the beginning of the next lesson

(a) (i) Mark clearly on an outline map the route of Alexander's march from Greece to the Indus
(ii) Draw a plan of the Battle of the Jhelum

(b) Why did Porus fail? What was his reply to Alexander when brought captive to the Greek tent?

(c) Give an estimate of Alexander as a (i) man, and (ii) general.

APPENDIX C

SPECIMEN ASSIGNMENT

The story of India from 1525-1784.

Age, twelve and thirteen years

Assignment for the first month: The Mughals in India

Books used: H Shastri, *Bharatbarsher Itihasa*, R C Muzumdar, *A Brief History of India*

Reading H Shastri, pp 25-32, R C Muzumdar, pp 115-143

Optional reading See 4 below.

In reading notice —

1 *The Mughals* Who they were, where they lived and why they began coming to India

2. *The Mughal Conquest*

(a) Note the earlier raids from Chengizkhan up to Babur's time. Who was Babur and why did he want to come to India Babur did not like being called a Mughal Why?

(b) *The Powers in India*. (i) *The Lodis*, Daulat Khan Lodi and Ibrahim Lodi were quarrelling Why? What pretext had Babur to invade India in 1525? (ii) *The Rajputs* What attitude did the Rana take up in the beginning? Why?

(c) *Struggle for Supremacy* (i) *Panipat* Notice the factors that lead to success Handicap through use of elephants. What attitude did Singram Sinha take up after the battle? (ii) *The Battle of Kanua* Notice the additional factors that led to success Notice also the bravery of the Rajputs

EXAMPLE 2 EXTRACT FROM THE 'LINE OF TIME' FOR USE IN A FEW CONSECUTIVE LESSONS. TO BE CONSTRUCTED IN THE NOTEBOOKS, IN USE ALONG WITH OTHER NOTES ON THE PERIOD

1700—
2—
4—
6—
Death of Aurungzeb : Accession of Bahadur Shah
8— Release of Sahu
1710— Defeat of the Sikhs
12— Balaji Bishwanath made Peshwa Accession of Jehandar Shah
Farukh Siyyar raised to the throne by the Syeds
14—
16—
Grant to the British at Calcutta
18—
Deposition of Farukh Siyyar by the Syeds and Mahrattas · Accession of Muhammad Shah
1720— Defeat of the Syeds at Shahpur . Baji Rao, Peshwa
22—
Growth of Haidarabad and Oudh as independent kingdoms under Chin Klich Khan (the 1st Nizam) and Saadat Khan
24—
26—
28—
Continued spread of the Maratha Power
1730—
32—
34— The Marathas occupy Malwa
36— Capitulation of the Nizam to the Marathas at Bhopal
38— Invasion of Nadir Shah
Capture of Bassein by the Marathas
1740— Balaji Baji Rao, Peshwa
42— Establishment of Maratha kingdoms at Gwalior, Indore, Nagpur, Baroda
44—
46—
48— Death of Sahu : The Government transferred to Poona Death of the Nizam
1750—

3 *Extension of the Mughal Empire under Babur.* His brilliant victories over the Afghans in Bihar and Bengal. Notice also his conquests in the south up to Gwalior

4. *Effects of the Mughal Conquest.* This is very important. Make a list and note especially its effects on (a) the Afghans and other Muslims. (b) the Hindus. (c) the art of warfare in India. (d) Gardening (e) Buildings. (f) Painting.

5. *The Mughal Kings.* 1526-1659. Find out what you can about the following :—

(a) Babur—his courage, loyalty to friends and devotion to his son. His *Memoirs*
(b) Humayun—his chivalrous nature. Struggle with Sher Shah Sher Shah's great reforms.
(c) Akbar—his great industry and indomitable courage. His conquests and generalship His Din-Ilahi What exactly it means? His attitude to the Hindus. His administration His court. His love of building.
(d) Jehangir—his indolent habits—a contrast to his father. Nur Jehan's great influence. His differences with Khurran Why? Mahabat's rebellion. The European merchants. His patronage of art and painting. His *Memoirs.*
(e) Shah Jehan—his conquests, his relations with the European merchants. The succession conflict. The cruelty of his reign His intolerance His love for his wife His love of building

6. *Life in Mughal India* This is the most important part of the month's work. Take any *one* of the subjects and work it out. Do as much as you can on this.

(a) Architecture, (b) Painting, Mughal and Rajput, (c) Weapons and armour, Mughal and Rajput, (d) Dress of the various classes of people, (e) Education, (f) The occupations of various classes of people, their standard of living, amusements, (g) Fairs and bazaars, (h) Gardens

It is part of the month's work to find your own books (under this heading) for illustrations and material

7. *Work to be done before the end of the month* :—

(a) Essay. Write an appreciation of the character of Babur or Akbar; or, Would India have been better off if the Mughals had not come?
(b) See section 6 above.
(c) Test.

APPENDIX D

A COURSE IN BIOGRAPHY (INDIAN HISTORY) FOR CLASS IV (average age 9-10) IN A BENGAL SCHOOL

A. Stories from Indian History.

(1) The Aryans, their settlement in India. Their life Stories of sages like Agashja and Vasistha. (2) The story of Ram. (3) The story of the war between the Kaurans and Pandaras. The life of Bhisma (4) Budha. (5) Alexander and Porus (6) Chandragupta and Chanakya. (7) Ashoka. (8) Samudrugupta; Vikramadihja (Chandragupti II). (9) Harshatardhan; Pulakeshin II. (10) Mahamir, Hasan and Horsain. (11) Gopāla, Dharmepāle, Devapāle. (12) Subaktagin, Mahemmad Ghezni (13) Mehammad Ghevi; Prithviraj and Joychandra (14) Kutub-u-ddin; Alauddin Khilji; Mehammed Tughlek. (15) Timur (16) Ramanada Kabir, Chaitanya and Nandk. (17) Babur. (18) Humayan and Sher Sheh. (19) Dhetree Panne. (20) Akbar, Rane Pratap. (21) Durgarati, Chand Sultana (22) Jehangir. (23) Sheh Jehan (24) Aurangzib; Shiraji. (25) Clive (26) Ahelya Bai (27) Lord Hastings, Lord Dalhousie. (28) Victoria the Good. (29) The Delhi Durbar (30) Sepoys Iswar Singh and Khodebad and the Victoria Cross.

B. Stories from Local History.

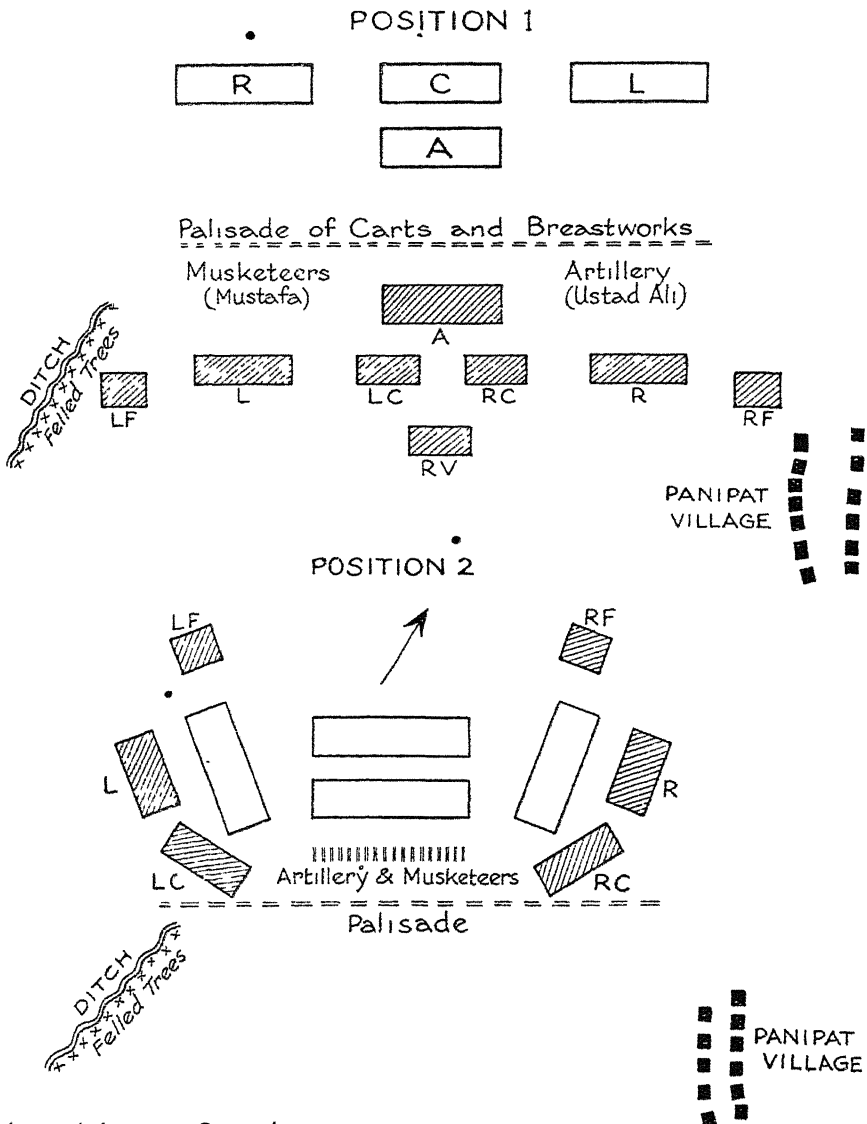
(1) Bejoy Sinha. (2) Ballal Sen. (3) Sultan Shamsuddin Ilyash Sheh; Raja Ganesh; Hursain Sheh. (4) Chand Roy and Kedar Roy, Isakhan; Protupuditya. (5) Alivardi Khan. (6) Rani Bhabani

N B.—The stories under Section B should be fitted into their proper places (in chronological order) under Section A

APPENDIX E

BATTLE PLANS

BATTLE OF PANIPAT



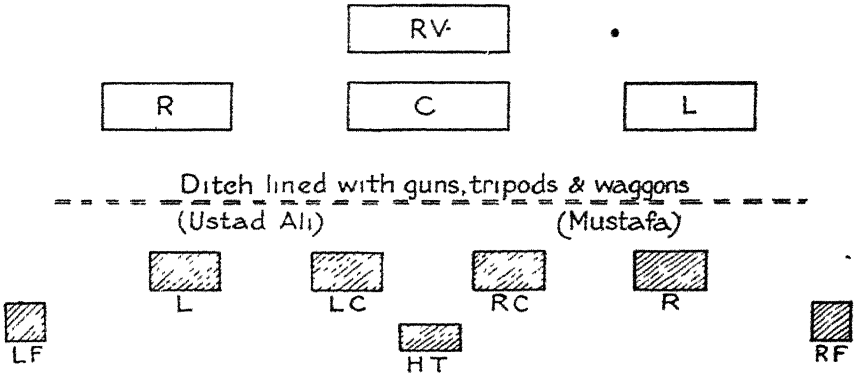
A = Advance Guard
R = Right Wing
L = Left Wing
C = Centre
LC = Left Centre
RC = Right Centre
LF = Left Flanking Party
RF = Right Flanking Party
RV = Reserve

Babur's Troops

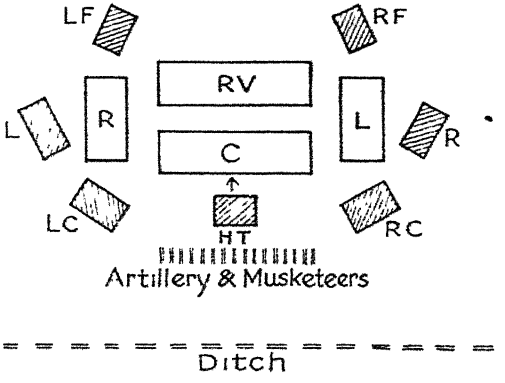
Sultan Ibrahim's Troops

BATTLE OF KANUA

POSITION 1



POSITION 2

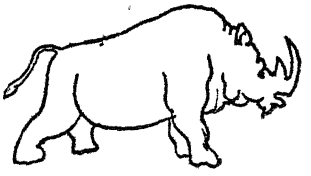


L =Left Wing
R =Right Wing
RV =Reserve
LC =Left Centre
RC =Right Centre
C =Centre
HT =Household Troops in Reserve
LF =Left Flanking Party
RF =Right Flanking Party

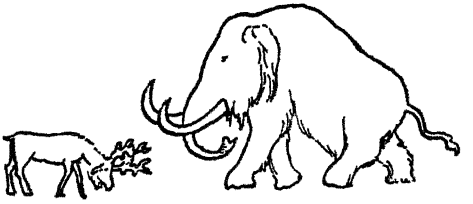
Babur's Troops
Singram Singh's Troops

APPENDIX F

MODELS FOR SKETCHES & PAPER CUTTING



RHINOCEROS

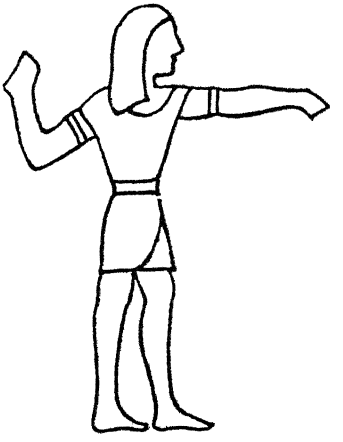


REINDEER AND MAMMOTH (pre-historic times)

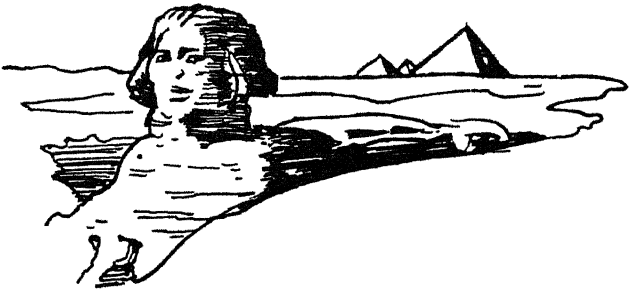




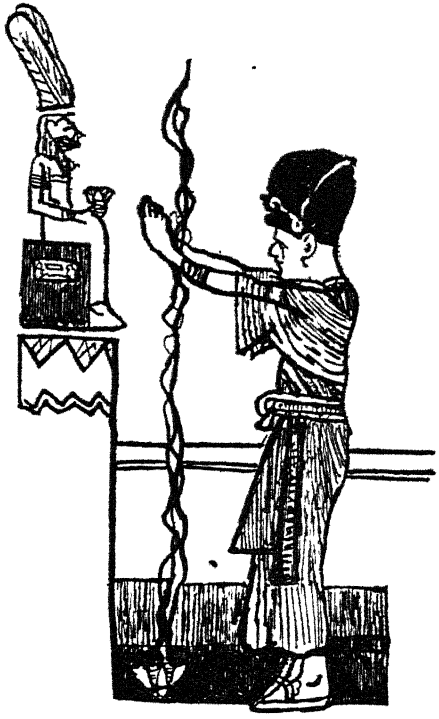
EGYPTIAN DOLLS



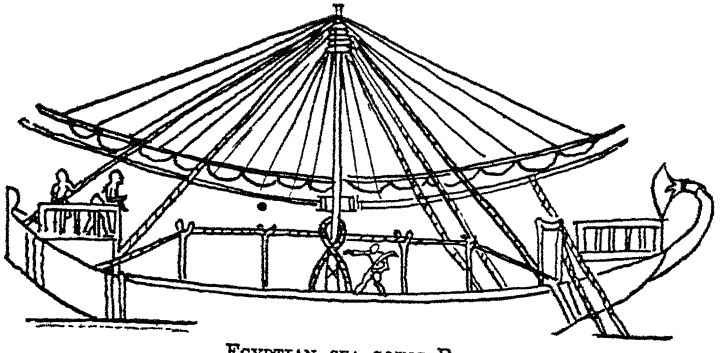
A CHARIOT-RIDER OF EGYPT
(paper cutting)



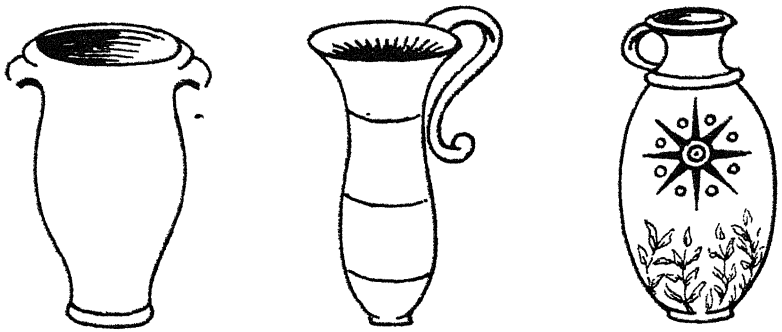
THE SPHINX



FAMILY WORSHIP OF AN EGYPTIAN NOBLEMAN



EGYPTIAN SEA-GOING BOAT



CRETAN VASES



A RAJPUT SOLDIER (from an old painting)

No fitter approach to the subject can perhaps be thought of than introducing the readers of this article to the ideals of the Greek citizen as embodied in the Greek civic oath :—

Aims

'We will never bring disgrace to this our city by any act of dishonesty or cowardice, nor ever desert our suffering comrades in the ranks; we will fight for the ideals and sacred things of the city, both alone and with many; we will revere and obey the city's laws, and do our best to incite a like respect in those among us who are prone to annul them or set them at naught, we will strive unceasingly to quicken the public's sense of civic thought. Thus in all these ways we will transmit this city not only not less, but greater, better, more beautiful than it was transmitted to us.'

A true citizen still upholds the same ideals, but the main difference to-day is that with the progress of society, his citizenship has very much widened itself in scope and he has realized that the culmination of the civic spirit is to become a citizen of the world, cherishing its best traditions and ideals and working unceasingly for its further progress along lines which make life nobler, richer and more beautiful. The substitution of the word 'world' in place of the word 'city' in the above oath could perhaps best give the measure of difference between the attitude of the ancient Greek and the most enlightened of modern citizens.

It was pointed out in the previous article that citizenship is a complex thing and depends on many other factors than a few lessons that the History course may provide. It is generally recognized to-day that true citizenship is the result of a training in character, fostering a definite attitude towards life and society, and a specialized knowledge of the institutions of the country, their workings and the ways in which the citizen can most effectively discharge his obligations in relation thereto. American schools, faced with the problem of turning out loyal citizens out of different nationalities that inhabit the country, have concentrated on the Civics course as the very foundation of school education They have tried to produce an atmosphere calculated to foster, if not a deep-seated, at least a rough and ready patriotism, by such things as encouraging the singing of national songs and impassioned speeches by teachers, leading the unwary boy to believe that America's influence has always been cast in favour of right and justice. The procedure in the majority of American schools (with of course a few notable exceptions) has given rise to misgivings as to the soundness of the character-training they impart and the broadness of mind they engender—things without which the child could never grow into a true citizen. England has been the very opposite of America in this matter. She has relied entirely on the training of character the boys receive from various agencies like the family, school, religion, society, etc., for the growth of the civic spirit. She has ignored to all intents and purposes the specialized knowledge necessary in enabling the citizen to discharge his varied obligations effectively, and has generally given no place

to Civics in the school curriculum. England has regarded this general training in character as the petrol that drives the machine, but it is quite reasonable to argue that without a knowledge of its various parts, their functions, their relations to one another and to the whole, the ways in which it can best be worked, it will not be well driven at all in spite of the petrol. The Indian school for obvious reasons cannot afford to neglect either aspect of the question.

Training in character

The school can effectively give the boy a foretaste of his responsibilities in life and a definite training as to how to tackle them. Most pre-eminently important from this point of view are the tone and influence of the school and the way its affairs are run by the boys themselves. By being encouraged to manage their own affairs, the boys get a valuable training in initiative, self-discipline, and a sense of responsibility. Whether they are conducting the business of the sports club, of the magazine committee or of the literary society, running a first aid society or a scout troop, sitting as judges in representative courts or tribunals to punish real offences against the school community and holding the balance of justice even, they are practising self-government of the most stimulating type. The valuable work done on these lines at the Perse School, Cambridge, or the Gary School in America is well known In America, where self-government in school is a fundamental feature in school management, great success has attended the organization of schools on the lines of a republic, like the George Junior Republic, or on the lines of a municipality, like the Gill School Society. Self-government in school whether in America or England has never belied the hopes and expectations that it had evoked.

Besides getting a training in habits of initiative and self-discipline, the children should learn, in connexion with the varied forms of school activity (such as getting up a school play, organizing a national day or playing a football match, etc., etc.) the great advantages of team work and co-operative effort as also of a mutual spirit of accommodation and understanding. The school should provide numerous opportunities of serving those that are less fortunate than the boys themselves, e g. the poor and the sick, thus strengthening the sense of a living community and the bonds of sympathy that bind its various parts, and the child be made to realize that the spirit of altruism and self-sacrifice that prompt him to put service above self, is really a mark of the divinity in man. He should carry away with him on leaving school a proper attitude towards work (in whichever station of life it may be), seeing in it opportunities of serving society that has conferred countless rights and privileges on him. The boys should be trained in the habit of right thinking. This can be fostered by arranging debates on interesting topics as also by allowing them to solve real problems in the conduct of their own affairs, e.g. selecting the best man available for the school captainship or any other office that needs be filled up, the organization work in connexion with the anti-malaria campaign in the village, etc. An attitude of eager curiosity should also be developed in the boys with regard to the great issues before the country. Without a genuine interest in affairs no one can fully discharge his duties as a citizen. Hints will be given in the next section as to how this can be done.

With regard to the second aspect of the question, viz. the knowledge that enables the boy when grown up to do the duties of a citizen, he can receive instruction of two kinds, (1) indirect, (2) direct.

1. Indirect

As without a fair stock of general knowledge Civics is an unintelligible study for the young, parents should make it a point to have their meals with the children so that they can get an idea of the parents' work and interests and of present-day affairs in general, as these are bound to be topics of conversation at meal-times. Some of his school subjects can be easily made the vehicle of carrying the desired type of knowledge to the child in an indirect way. Professor Nunn advocates an arithmetic of citizenship, setting sums on the municipal rates and taxes and thus familiarizing the child with the nature of some of the problems he will have to face some day. Such a course is an interesting feature of the Mathematics work at Bedales School.[1] Literature—epic, ballad and narrative types of poetry—is another subject that is full of the delineation of the highest ideals of character of various ages and adds a great impetus to the boy's natural desire to emulate the great and the good. Geography is specially useful in showing how the whole world is knitted up by commercial ties and in making the child realize its essential unity.

The History course is *par excellence* the course that can give the best help in this matter. Rightly handled, it can produce the sane level-headed patriotism that can discriminate between the right and wrong done by his country, and thus prepare the way for co-operation with other nations. From a study of Ancient and World History,[2] the consciousness will dawn on the child that society and civilization are a great co-operative business and our glorious heritage the product of the joint efforts of various countries and nations. This realization is the surest way of laying a stable foundation for internationalism without which no one can be a true citizen of the world. The establishment of a junior branch of the League of Nations Union in the school as a part of the History or Civics course (as is being done in many schools in Wales) organized on the lines of the League of Nations Assembly (representing various nations) and Council, not only to discuss and debate upon world affairs but also to keep the school informed of the literature, charts, maps, pictures published by the League, will go a long way in making international co-operation the normal method of conducting world affairs in the next generation. The incipient internationalism of the boy should be further re-inforced by the attitude of the whole school staff and the reading of newspapers, periodicals, and books, especially by foreigners.

The creation of an eager interest in present-day affairs can also be facilitated to a considerable extent by History. While dealing with the problems of past ages, constant reference should be made to their ramifications at the present day, thereby giving the boy a better understanding of present-day problems and their historical antecedents. This linking up of the past with the present, not only through the History lesson but also by many informal discussions where a frank interchange of opinion is possible, very

[1] Drummond, H A, op cit.

[2] Mr H G. Wells makes the interesting suggestion in his *New Teaching of History* that the broad facts of world history should be taught in the same terms all over the world as a corrective to national egoism and arrogance.

soon gives the child a working knowledge of present-day affairs. A short talk on current affairs, given from time to time by the headmaster, is also highly useful.

2. Direct

Before imparting instruction as to the country's institutions and their workings, it is a better plan to prepare the ground by informal talks and discussions in class on the varied avocations of the parents of the boys and the nature of the services they render to the community, as also on the familiar facts and figures in the child's environment, always bringing out the fundamental idea that, beginning from the sphere of the home to any form of community life the child can imagine, co-operation is the very basis of society. Naturally it is best to start with the home and the locality—things with which the child is most familiar and then gradually to introduce him to the features of provincial and central government. For the lower middle forms there should be an informal Civics class every fortnight or week when the teacher or the headmaster should be present. Each boy can enlighten the class (of course in a very general way) as to the work his father or mother does and then there can be a discussion in which the teacher or headmaster may take part, if necessary Thus in a normal class of thirty boys there is sure to be a discussion on the doctor, the lawyer, the judge or munsiff, the teacher, the housewife, the engineer, the postal officer, the police officer, the corporation officer or member, the member of the Legislative Council, the zamindar, the banker, the clerk, perhaps even the postman, tram-driver, cobbler, etc , etc. The children may also be encouraged in these classes to put questions on any facts or features of civic life that they may have noticed or thought about, e g the making, cleansing, sweeping, and lighting of the roads and the people who do these things, the policeman, the farmer, the magistrate, the Governor, the fire-brigade, the caretakers of public parks and gardens, the scavenger, and countless other topics that have evoked the child's curiosity [1] The bright boys might be given a chance to answer some of these questions, provided their answers are supplemented by the teacher or headmaster who would impress upon the class the social importance of the services rendered by these people and thus sow in young breasts the seeds of a wholesome respect for every kind of work done to keep society from falling to pieces. There should be no formal syllabus for classes VI and VII. The topics discussed informally should be suited to local conditions and will vary from school to school. With this proviso, they might be of the following nature:—

SUGGESTED SYLLABUS

Class VI (age 11-12)

1. **Individuals of the social environment**: the doctor, the teacher; the judge, the lawyer; the circle officer, or the S D O, or the district officer, the choukidar or policeman; the postman, the farmer, the dairyman, the merchant, the grocer, the union-board or corporation officer; the street lighter, the scavenger; the engine-driver, the industrial workers, etc

[1] A scheme similar to this has been found very successful by Mr. Greening Lamborn, Headmaster East Oxford School.

2 The social community—the linking up of individuals.

(a) Home—the idea of co-operation

(b) The farmer { baker, butcher, miller, dairyman, the railwayman, the merchant

(c) The postman { railwayman, lorry-driver, sailor, airman, postmaster

and so on

3 Study in nature. various animal communities.

(a) The life of the bee (the bee hive).

(b) The life of the ant (the ant hill), etc

Limitation of space precludes the possibility of setting out in detail the nature of the topics to be discussed informally in class VII. It is sufficient to point out here that they should deal mainly with the civics of the school and of the village or the town, laying stress on the ballot and the questions to be considered by the school child before voting for the class monitor or school captain, as also on the local services, markets, communications, etc

From class VIII formal study of civics should be begun Considering the fact that History and Civics are not yet compulsory subjects for the two next higher classes in Indian schools, it becomes necessary to give the boys through a one-year course a fair idea of the whole ground covered by the subject The syllabus might be framed on the following lines —

Class VIII (age 13-14)

1 A brief history of the boy's village or town Take Calcutta for the sake of illustration Large plan of Calcutta, showing marks of antiquity

2 How Calcutta is governed.

(a) Those responsible. Mayor and Corporation Members of Corporation Mock Election The Commissioner of Police

(b) Work of the Corporation. why rates are needed. Various committees dealing with Health, Education, etc. Visit to Corporation Free Primary School, Playing Park and Health Exhibition.

(c) The Improvement Trust: what it is and how it works Great impetus to health and beautification of city.

(d) The District Boards how appointed, their jurisdiction

(e) The main industries plans of Kidderpore and King George's Docks. Visit to King George's Dock. How a factory is run—visits Trade unions Their recent growth. Housing conditions Any other topic connected with this section

(f) The rights and duties of the citizen of Calcutta Wide extension of the meaning of 'citizenship'.

3 Provincial and Imperial Government.

The Governor, His Executive Council The Ministers. The Inspector-General of Police The District Officer and other executive officers The duties of the Government in respect of maintenance of law and order, education, public health, facilities of communication, encouragement of agriculture, industry, trade, etc. How this is done—the laws The Legislative Council Mock election The procedure in Legislative Council Mock reading of a Bill

The King, Cabinet, the Secretary of State for India, the Viceroy His Executive Council The Legislative Assembly The Council of State The Chamber of Princes

4 Who is to say whether the law is broken or not—the work of the lawyers and law courts A mock trial The Judicial Committee of the Privy Council

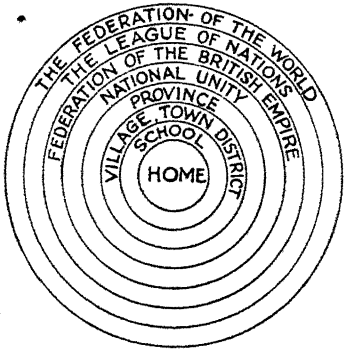
5 The Empire The bonds of political and economic unity between the various parts of the Empire Imperial Conference. The rights and duties of a citizen of the Empire

6 The League of Nations Its aims, machinery and achievements Mock Assembly of the League of Nations India in the League of Nations

7 The Federation of Mankind or the Parliament of Man

In the highest two classes some of the topics included for class VIII will be done in greater detail and a few new ones of interest and importance will be introduced

If the syllabuses sketched or hinted at above have been followed, our study will be represented by the following cycle which is in strict conformity to psychological principles :—



Methods

Some of the methods of dealing with the subject have already been discussed. It must have been perceived that they will be extremely varied With the younger boys the principle of activity and expression work will be as prominent a feature here as in the History course There will be making of maps and plans, mock village meetings to elect Union Board members, real trials by the Juvenile Court, a rehearsal of police court procedure, drawing up advertisements for clerks and interviewing the candidates, lectures by the children, discussions and debates, etc. Frequent visits to places of civic importance will be very useful in opening the child's eyes to his environment, in giving him an idea of the great services rendered to the individual by the community, an insight into the management of institutions and in filling his mind with a lot of invaluable knowledge in the most practical way. The younger children should be encouraged to keep diaries and books of information about places and people The possibilities of this method are amply shown by the notebooks or diaries of some of the boys of the Dacca Armanitollah H.E. School who became interested in the city of Dacca and extremely keen on finding out everything about it. From their labours, they compiled neat and respectable looking books, containing a map of Dacca, the results of the survey of the city which the boys themselves carried out in groups, an account of its various parts or districts, the people who live there, their dress, speech, religious beliefs and festivals, the housing conditions in the town, the city's drainage, water supply, literacy, industries, communications, fairs and markets, historical antiquities with pictures and a brief description under each, the municipal rates and taxes, rounded off with a few suggestions as to the improvement of the city. This very interesting hobby might be continued beyond the middle school with great profit. In the case of the older boys, debates, discussions and lectures by themselves will find a more prominent place. Whether young or old, the children should receive every encouragement to read newspapers of the best type intelligently. Reading of the best type of newspapers, so conspicuous by its absence amongst Indian boys, is

the surest way of leading to an intelligent and steady interest in present-day affairs—an interest without which no citizen can effectively discharge his public duties later on. Discussions and talks on current events not only help the intelligent study of newspapers, but also in freeing the mind from the evil effects of propaganda that is very often carried on by the press. The great thing in these discussions, both for teacher and taught alike, is to keep an open mind and not to suppress relevant facts from any consideration whatever. Such questions as the opium traffic in India, especially in Assam, the future constitution of India, the problem of the Indian States, the position of the Indian in various parts of the Empire, especially in South Africa and Kenya, India's connexion with the League of Nations, the difficulties in enforcing the Sarda Act, the abolition of untouchability and the purdah—these, and a thousand other burning topics of the day, should be threshed out so that the future citizen may bring an enlightened mind to bear on the solution of the problems with which he will soon be confronted. Thus trained, he is certain not to be swept off his feet by the impassioned oratory of self-seeking demagogues. Enough has been said, I think, to show that, given the proper attitude, effective citizenship can only follow a period of study and clear thinking. Without adequate preparation stretching over a fairly long period, the boy from the school cannot blossom into a full-grown citizen the very day that he turns his back on the four walls of his academy.

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CHAPTER 9

THE TEACHING OF GEOGRAPHY

Introductory

IT is scarcely too much to say that no school subject has changed more fundamentally within recent years than has Geography. The subject as taught in the school days of many teachers is quite different from what is understood by the term 'Modern Geography'. It is therefore of primary importance to realize the different viewpoint which is necessary in teaching the subject at the present day.

In the older textbooks Geography is frequently defined as a 'description of the world and its inhabitants'. Unfortunately the subject is still regarded by many to-day as if it were merely a descriptive catalogue It used to consist principally of having to learn long lists of facts First of all came definitions of islands, peninsulas, capes, bays, etc, definitions which had to be committed to memory. Then followed lists of facts concerning the countries of the world, lists of capes, bays, islands, rivers, later of towns and ports, whilst the special division called 'Commercial Geography' consisted of learning off other long lists of products and exports or imports Such catalogues of facts, however important, will not pass as Geography at the present day, and a warning may at once be given against any book which starts off with a series of definitions and proceeds to give long statements of facts of the character just indicated

What then is the difference between the old and the new Geography? Simply and briefly it is as follows: In the old Geography we learnt and had to remember long lists of facts and afterwards we sometimes learnt the reasons for them, though the reason was usually a secondary consideration. We learnt, for example, that London on the Thames is the capital of England, and Paris on the Seine is the capital of France, that Berlin on the Spree is the capital of Germany; we learnt also that Bombay exported cotton, that Calcutta exported tea and jute, and that Rangoon exported rice—but the reason why the capitals of countries were situated where they are and why the ports of India each have their own peculiar exports did not come into consideration very much The birth of the new Geography dates from the time when it was first realized that these multitudinous facts about the surface of the earth and its inhabitants were, in reality, for the most part, the result of a few simple causes If we start first by studying these causes, half the work is already done without the exercise of the vast amount of tedious memorizing which was previously required. Summarizing, 'the old Geography started from the effects and sometimes worked back to the causes,' 'the modern Geography starts from the causes and gradually works to the effects.'

It should always be the first consideration of the teacher to look for a reason and to avoid as far as possible teaching a fact merely as a fact without searching for the underlying reason. To take one of the examples already quoted: Calcutta exports jute because of the suitability of climatic and other

conditions in the Ganges delta to the growth of the jute plant, and tea because the tea-gardens of Assam, where again climatic and soil conditions are specially suited for the growth of the crop, lie in the hinterland of the port

It has been mentioned that the underlying causes are comparatively few. They may be grouped under the headings of (1) Physical Features, (2) Structure, (3) Climate, (4) Vegetation and (5) Animal Life. Let us for a moment look at each of these fundamental factors.

1. Physical Features

The *Physical Features*, or topography, of a country are determined by nature and cannot be altered to any extent by the activities of man. If a country is very mountainous, it will always remain very mountainous, and the activities of its inhabitants must obviously be determined by this fact. In Kashmir, for example, the amount of flat land suitable for cultivation is obviously strictly limited. On the other hand, the great Ganges plain must remain a broad level tract essentially without any hills at all

2. Structure

In the second place, the surface features of the land are nearly always the reflection of the underlying *Geological Structure*. Here again man is quite incapable of altering in any way this structure. This becomes of special importance when we consider the distribution of minerals of economic importance Man cannot put a coalfield where a coalfield does not already exist He can only abstract gold or lead or any other mineral from those parts of the earth's crust where it has already been placed by nature So we see that the underlying structure is the second of those fundamental causes which determine the activities of man.

3. Climate

Of almost equal importance is *Climate*, the average state of the weather. Our everyday activities, though we may think little about them, are very largely governed by the weather. The annual routine is similarly determined by climate the sowing of paddy, the time of the paddy harvest, the gathering of the cotton crop, the planting of wheat in the Punjab and its reaping, are but two or three examples of the influence of climate on the activities of man. The fact that rubber is produced in Burma, Southern India and Ceylon, but not in Northern India, is another example of the controlling influence of climate. Over broader fields, the difference between the great evergreen forests of the Western Ghats and the arid wastes of the Thar Desert reflect the differences in climate, especially the distribution and quantity of rainfall, whilst the totally different products of the tropics when compared with temperate lands, are again primarily the result of climatic differences.

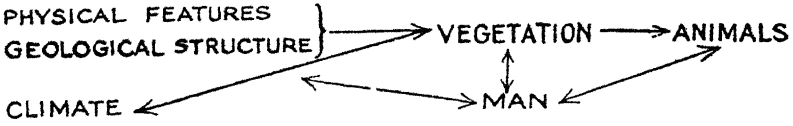
4. Vegetation

Climate and structure combine to produce the soil, which is therefore widely varied from place to place The effect of soil and climate is first seen in the *Natural Vegetation* cover of the earth, so that vegetation can also be included as one of the fundamental underlying causes With natural vegetation we may include artificial vegetation, or agriculture.

In its turn the natural vegetation determines very largely the character of the wild *Animal Life*. The monkeys so familiar in the trees of the forests would find themselves very unsuited to life in the arid deserts,

whilst the camel would not survive very long if turned loose in a mangrove swamp. Just as wild animal life is determined by natural vegetation, so the domestic animals which can be kept by man are limited by the natural factors of the environment. We may group man himself as an animal influenced by the factors just enumerated, but man is a thinking animal and hence able to alter, to some extent, the habitat in which he finds himself. He can, for example, terrace a hillside and so form small paddy fields, where it would otherwise be impossible for paddy to grow. He can utilize the water of the great rivers in irrigating the land and so counteract the effects of low rainfall. He can cut down the natural vegetation and within certain limits grow crops according to his own requirements. He can of course destroy the natural animal life and keep only his own domestic animals For these reasons it is better to refer to the *geographical influence* rather than to the geographical control of the factors which have been mentioned. The little diagram given below illustrates the way in which the five factors operate.

5. Animal Life



At whatever stage one may be in the teaching of Geography it is always advisable to keep in mind this fundamental idea which underlies the whole of the teaching of modern Geography, the idea of geographical influence Geography which works along these lines is sometimes called 'causal Geography', because it deals with causes, but causal is a bad word, because some people reading or writing it carelessly put 'casual', and modern Geography is certainly *not* casual.

The use of Geography

We are sometimes asked what is the use of Geography. We may perhaps with advantage here quote from a little book on the teaching of Geography:[1] 'When we are children our ideas are limited by just what we can see of our own village As we grow older our horizon extends · we travel by train, we find there are other villages and towns, larger than or different from our own The world becomes a much larger place than our childhood's imagination pictured it. By personal experience we gradually learn a little more about the world as we go on in life, but usually our personal experience is restricted to our own particular country, a very small part of the whole world. There is a story about two old men who went to the seashore and saw the sea for the first time. One of them said, "How wonderful! I did not know there was so much water in the world." The other one said, "Yes, and you can't see much more than half of it from here" Of course the old man actually only saw about a millionth part of the whole. We should be in the same position if it were not for Geography. We only see about a millionth part of the whole, but Geography can teach us to picture something of what the rest is like (Geography is thus a very "mind-broadening subject", perhaps more so than any other school subject.'

[1] Stamp, L D and E C., *How to Teach Geography.*

Realism in teaching

One of the greatest difficulties in the teaching of Geography is to make the subject matter real. We may learn a set of facts about a foreign country, but we do not necessarily get a picture of that country in our own minds. Often only travel and personal experience can do that. When we travel we move away from our own homes and our own people and in visiting new lands and new people instinctively compare them with those of our own home surroundings. Geography may with advantage be taught along the same lines. We start with a careful study of our own homes and our own country. This is doubly important, because until we start thinking about our own home surroundings we do not notice all the facts which we should; in other words, our powers of observation require training. Hence one of the first duties of the Geography teacher is to arouse an interest in the child's immediate surroundings and in the incidents of everyday life. From this, which is known, and can be observed or verified, we can proceed to that which is unknown and cannot be verified. We must seek to make real the descriptions of foreign lands by comparison with our own. A thorough knowledge of home Geography is essential before we try to teach the details of the Geography of foreign lands. Of course, each stage in the instruction may with advantage be enlivened by references to life in other countries The interest of small children is easily aroused by showing them, by means of pictures, how children in other lands spend their everyday lives. Simple as this appears it is far too often forgotten in Indian schools Many a boy or girl, when it comes to the High School Examination, knows far more about the products of Australia than of the Ganges valley, and more about the position of New York than of Bombay.

In the preceding paragraph we have referred to the need for arousing interest in home surroundings. The mere teaching of Geography of the home country is not sufficient The child must realize how closely the subject, although taught in school, is related to his everyday life. More Geography can be learnt in the nearest bazaar than in dozens of books.

A key subject

Another very important point is to bear in mind the position which Geography should occupy as a key subject. In fact, all subjects taught in school should fit together to form a complete whole. It is a very wrong idea to regard school subjects as if they were occupying watertight compartments. They are much more like the shaped stones which go to form a bridge; each one depends upon the other and the removal of one will form a serious gap and perhaps the collapse of the whole structure. It has been said that Geography is at once a science, an art and a philosophy. It is in fact the cream of a number of sciences and arts carefully blended. The geographer uses certain of the results of such sciences as geology, meteorology, oceanography, anthropology, sociology and economics, because they concern the environment of his central figure, man. From the point of view of the school subject this should be stressed by correlating, as far as possible, the work in different subjects. Geography often supplies the background for the History lesson, whilst the meaning of scales on maps affords many practical examples for exercises in proportion, and the Arithmetic master will find that sums on area and square measure gain a greater reality and importance when applied to actual maps

Having referred briefly to the outlook of modern Geography, we can proceed to deal with the teaching of the subject in the schools of India Before doing so it must be pointed out that modern Geography has official sanction. The syllabuses of the various provinces of India embody the suggestions which have just been made. Thus Bombay, in Schedule D, says Geography is to be treated 'not as strings of names to be committed to memory but as a study of man in relation to the earth . . . The relation of cause and effect should be emphasized, whether physical or political, economic, social or moral' Bengal is even more emphatic in this insistence upon the modern point of view, the training of observation and the proceeding from the known to the unknown ; whilst Madras also stresses the same points.

There are certain general principles of teaching which apply throughout the teaching of Geography Nearly all of us are possessed of five senses, hearing, sight, smell, taste and touch, and we can learn much more quickly if we learn through two or more senses at the same time It should therefore be the aim of every Geography teacher to present his subject through the ear, the eye and the touch together . that is, through oral instruction, through reading and the study of maps and through handwork such as the making of models at the same time The last method is especially important in the case of small children

To be kept up to date

Finally, Geography is a subject which, being concerned with the world about us, progresses and changes as that world progresses and changes Out-of-date books and out-of-date maps must be carefully avoided. Many of the books written in the days of our fathers are still in print and plausible booksellers are only too anxious to get rid of their stocks of such books The political map of Europe was completely changed as a result of the Great War, yet in 1926, in answering a certain High School Examination question in one of the provinces of India, not less than thirty per cent of the candidates described Vienna as the capital of the Empire of Austria-Hungary In connexion with the keeping of the subject up to date, the importance of illustrated magazines and newspapers should be noted

Scheme of teaching

It is always impossible to build without foundation The type and extent of Geography taught in the high school must depend very largely on that which has been taught in the associated middle school, whilst the work in the middle school must be determined by that which has been carried out in the primary school Although this is obvious, it is unfortunately frequently forgotten, and high school masters attempt to embark on a scheme of Geography teaching without taking into consideration that their pupils have not yet received the groundwork which is essential for such a scheme No excuse is made, therefore, for outlining in this chapter a scheme of Geography teaching from the early stages in the primary school, because high school teachers must decide for themselves how much of the primary and middle school work must be gone over again before they attempt high school work, or whether they can safely assume that all of the ground has already been covered. Broadly speaking, it is far safer to be certain of a satisfactory and thorough groundwork than to attempt to advance studies too rapidly. We shall therefore consider in the next section Geography in the primary school.

Geography in the primary school

In most cases the syllabus for the primary school work in Geography is laid down as a broad guide rather than a definite syllabus, and in most provinces the teacher is allowed a wide latitude in the way in which he covers the primary school course Broadly speaking, the requirements for the primary school are as follows:—

1. An elementary knowledge of the principal terms used in Geography, such as mountains, plains, oceans, etc , to be taught with the aid of the sand-tray or models or pictures, and illustrated from examples in the neighbourhood of the school.

2. The meaning of a map or plan, illustrated by a plan of the school and its surrounding country.

3. The simple Geography of the province leading to

4. Simple Geography of India, and

5. First principles of World Geography.

In nearly every case the syllabus warns us to work from what is known and can be seen in the immediate neighbourhood of the school, to what is unknown, first in the province and then in the whole of India and then in the outside world.

Specimen syllabus

There are two principal methods of covering such a syllabus. The first is to take a definite object, study it in connexion with its local significance and importance, and then to pass on to what it can teach us of foreign lands Thus in each lesson we get taken by a particular object from our own homes to some distant part of the world We reproduce below by permission from the *Burma Geographical Journal*, No 3, Sept 1925, a detailed scheme of lessons for the first year of work, a scheme which was used in one of the largest Anglo-vernacular schools in Rangoon with considerable success

I FIRST TERM—JUNE TO OCTOBER

Note on the method generally: one topic will be dealt with each week (three lessons) First lesson, discussion by the teacher and the class together of the topic second lesson, the making of models; third lesson, oral composition by question and answer based on the model as a revision of the topic

June

(a) The fish bazaar . kinds of fish seen in the bazaar, description and native names of them, how and where they are caught, discussion of the different methods of fishing used locally. Model: different pupils will make different models of various methods, traps, nets, lines

(b) Where the fish we eat come from, the river, the delta, lakes Description of the river or delta, its appearance from the air, large streams and small creeks, what the fish live on, description of a day in the life of a fisherman. Model sand-tray and clay models of the river or delta

(c) Fishermen in other lands: the Esquimo, where he lives marked on the globe, description of his home, his family, his surroundings, and a day in his life Model: an Esquimo scene in the sand-tray, in paper and cardboard, powdered chalk for ice and snow

(d) Fishermen in other lands: the English fisherman, where he lives pointed out on globe, how he catches his fish, trawl-net, his fishing boat (sailing and steamer), how he sells his fish. Model: clay model of a steam trawler with trawl-net

July

(a) Study of rain (outdoor lesson) . size of raindrops in different showers; put a slate in the rain and watch the drops that fall on it They fall at intervals. Where

does the rain that falls in the playground go to ? How does it go ? Watch the adventures of some raindrops from the moment they reach the ground Careful description of what happens to them. Model : a copy, in either sand or clay, of a rain-trickle from the beginning to the drain

(b) Study of rain (outdoor lesson) : detailed study of a single rain-trickle running from a high place to the drain ; its general course, its banks and shape at various points , why it does not go straight ; the sand it carries along and where that sand is deposited , study on a dry day of sand deposits in the compound and discussion of how they come there Model : a copy, in either sand or clay, of a rain-trickle

(c) The local river—is a big rain-trickle ; where the water comes from ; where the mud in it comes from ; why the banks are faced with stones , pupils from the up-country districts will describe to the class what they have seen happening to the banks of other rivers—caving in, and building up Model . model of a river in clay, with sand deposits.

August

(a) The vegetable bazaar : vegetables seen in the bazaar named and classified in two ways—into local and up-country, and into native and foreign Discussion of where they grew and how they are grown. Model · clay models of different vegetables

(b) Vegetables growing in other lands : rice in Siam, Japan, India, China, those places shown on the globe, and pictures of rice fields. Tea similarly. Wheat grown in England and Canada. Models : different boys will do different models in sand or clay of rice fields, tea plantations, etc

(c) Cultivation in the hills of India or Burma : conversation on a day in the life of a boy living in the hills. Model · a hut of some hill tribe

2 SECOND TERM—NOVEMBER AND DECEMBER

November

(a) Cloth bazaar : kinds seen named and classified into local, up-country and foreign Discussion on how cotton clothes are made from the beginning Model . a loom

(b) Clothes in other lands . Esquimo furs, wool in England and Australia, cotton in America and Manchester , Manchester pointed out on the globe, picture of a Manchester cotton mill Model : sand-tray model of a cotton plantation, a steamer carrying the raw cotton to Manchester

(c) Clothes in other lands : camel hair in the desert Conversation on a day in the life of an Arab boy Model · sand-tray model of the desert with oasis in green paper, clay camel and paper Arab tent

(d) Timber : the life-story of a teak tree Model · a teak raft.

December

(a) Forests in other lands : African forests, description and pictures Description of a day in the life of a pigmy boy Lumbering in Canada Model · some boys will do a model of a pigmy hut in Africa and some will do a model of a lumber raft in Canada

(b) Means of transport conversation about the local railway station , passenger trains and goods trains , how to send goods by goods train (goods station) , conversation about docks, kinds of steamers seen, and where they go to ; places shown on the globe

(c) Transport in other lands : Pacific Islands canoe , Esquimo sledges , Arab camel ; Chinese mule , English liner. Models . different boys will do different models, making their own choice.

3. THIRD TERM—JANUARY TO MARCH

January

(a) Direction Where the sun rises , each boy will tell the class exactly where the sun looks to him to be at dawn, from his own house. East pointed out at school Similarly, west, from the sunset East-and-west line drawn permanently in paint on the floor of the classroom Model . east-and-west line fixed by each pupil on his own desk From this, north and south The Great Bear Pupils will describe to the class the position of the Great Bear and the North Star, as actually observed by themselves at night

(b) The compass (from the Science room) How it is used Model : a compass in cardboard

(c) Imaginary journeys through the windows, walls of the classroom in given directions. Position of well-known buildings in the town (compass directions) with reference to (i) the school, (ii) pupils' own houses.

(d) Plan of the classroom. Walks round the classroom marked accurately on the pupils' own plans.

February

(a) Plan of the school-building, showing classrooms and main doors. Walks round the school marked by lines accurately on the boys' own plan

(b) Plan of the roads surrounding the school, showing well-known buildings Walks round these roads marked carefully on the boys' own plans

(c) Very simple plan of the town or village Walks in the neighbourhood marked on it

(d) Revision.

The second method follows the provincial syllabus rather more closely. In the first two or three years the time is devoted to the study of the neighbourhood of the school and the province in which the school is situated, introducing at the same time all the elementary principles of Geography Then the principal facts in connexion with the Geography of India are introduced, whilst in the fourth and final year the elements of World Geography are taught. This method requires two or three small textbooks for the guidance of the teacher and of the pupil. Most teaching at this stage will of course be in the vernacular, but the remarks in this section apply equally whether they are concerned with teaching in the vernacular or in English. The books required are.—

1. A very simple Geography of the province, bringing in at the same time the main geographical definitions and principles;
2. A very simple Geography of India;
3. Another very simple little book which shall lead from India to foreign lands by easy stages and with the help of familiar objects.

As a matter of fact (1) and (2) just mentioned may with advantage be combined. Using an actual textbook relative to the province often ends in the teaching being of much too stereotyped a character for this stage. It is better to take a little book on India as a whole and for the teacher to draw examples from local conditions and from the province in which the school happens to be situated. The following list indicates the ground such a textbook should cover, and it will be seen how in each lesson the teacher, from his own experience, can give special importance to the province itself.

1. What is Geography?
2. What is India? (Points of the compass, boundaries and size.)
3. What kinds of people live in India? (By noticing the different dresses, customs, etc, seen around)
4. Things people do (in the country) (farming, fishing, home industries).
5. Things people do (in the town) (trade, business, government).
6 Our Homes (construction, materials, where they come from).
7. Our Food (different kinds of food, where it comes from, etc).
8. Our Clothes (material, how prepared, where it comes from).
9. Things we use (home products, foreign goods)
10 What we can learn in the bazaar (trade and exchange, etc.).
11 How we travel (land and water, old ways and new ways).
12 Mountains, hills and plains (physical definitions).

13. Rivers.
14. The Sea.
15. Something about Heat.
16. Something about Wind.
17. Something about Rain
18 Seasons in India
19 Useful Animals and where they are found in India.
20 Useful Trees and where they grow in India.
21. Useful Plants and where they grow in India
22 Useful Minerals and where they are found in India
23. How the useful things are taken from one part of India to another.
24. Where people live in India.
25. What India does for other countries
26. What other countries do for India

By this means a good foundation in knowledge of local Geography will be established.

An excellent method of proceeding in the case of small children from the home Geography to World Geography is to choose a number of objects selected from goods displayed for sale in the local bazaar or contained within the school buildings, and to make each object tell its own story, and by this means to give a picture of life in other parts of the world A selection of suitable objects has been made in a small book, entitled *First Steps in World Geography for Indian Schools*. There the objects chosen are all of foreign manufacture and have been so selected that each one tells of a different part of the world. For example, a box of matches, clearly labelled 'Made in Sweden', is utilized to trace back the history of the wood of the match to the pine log from which it was made, and then to the pine forest in which the tree grew. This leads on to the character, the climate and the distribution of such forests, and the life of the people who dwell there. By the time the whole eighteen objects have been dealt with, the entire world has been covered and the child has learned simple truths concerning every one of the great natural regions of the world [1]

There are of course innumerable books which deal with Geography for the primary schools, but the majority of these can be grouped into two classes first, there are those which follow along the lines of the old Geography, and should be rigidly excluded by the present-day teacher. They usually start with a series of definitions and hence should be readily identified by the teacher. Not only are many of these very definitely opposed to the spirit of the modern teaching of Geography, but a large number contain downright errors. Unfortunately teachers and pupils alike are frequently far too much impressed by the value of the printed word, and anything which appears in print is liable to be accepted as true. Hence these small manuals are particularly dangerous. To give just one example, I have in my possession an elementary Geography of Burma, printed and published in Rangoon. The author wished to illustrate his book with a map showing the railways of Burma. He therefore borrowed one from the railway company which showed the existing lines in black and the proposed lines in red.

[1] Too much stress cannot be placed on the importance in modern Geography of the idea of 'natural regions'.

To save expense the publisher reproduced this map in black only, so that the red lines came out black also, and in this Geography book there is therefore a wonderful zig-zag railway connecting Calcutta and Rangoon—a railway which does not and probably never will exist.

Secondly, there are numerous elementary books written for boys and girls in England Many of these books are beautifully printed and illustrated and excellent in every respect. But they are written from an entirely different standpoint, they are adapted to the mentality of the English child, and the standard of comparison throughout is the temperate land of England. They are not, therefore, suitable for use in India, unless very carefully adapted by the teacher. Sometimes the amount of information in these books is very small in comparison with the amount of reading material, because they are used in the schools of England as readers. For example, in many of the series, a *whole book* is devoted to telling the story of the unimportant people who live in the frozen wastes of Arctic lands. The effort of covering so much reading matter is obviously very much greater for the Indian child who is learning in a foreign language. Moreover, fairy stories well-known in England but entirely foreign to India are often introduced.

From these remarks it will be seen that there is a very great advantage in using one of the modern books published in India, and written especially for Indian needs.

In a later section we shall deal with the simple equipment which is required in the teaching of Geography, but it should be noticed here that in the primary school it is very important indeed that the topics under discussion should be presented, as we have already suggested, through the eye as well as through the ear, and with the double assistance of handwork. Thus in the primary school, materials for model-making, sand-trays, etc., are very important, whilst every such school should possess a large, brightly-coloured physical wall-map of India, a globe, a large blackboard with plenty of coloured chalks and a collection of pictures of geographical interest It will often be found possible to rouse the interest of the children by getting them to make a collection of pictures for the school. It is true that the selection available is often very varied. I have in mind a small primary school in one of the villages of Burma, where such a collection had been made. It included a number of cuttings from illustrated papers such as *The Times of India*, picture-postcard views of various towns, which served to illustrate the different conditions of life in the cities when compared with the villages; it also included a considerable series of popular cinematograph actors and actresses. The latter are scarcely to be described as geographical, but the enthusiasm of the small children of this school would have been seriously impaired, had the material been too definitely limited.

Geography in the middle school

There is of course a very considerable variation amongst the provinces and states of India in the wording of the middle school Geography syllabus, but if we take the trouble of analysing the syllabus, we find that in nearly every case certain common ground is to be covered Nearly every syllabus demands :—

1. A detailed Geography of the province in which the school is situated.
2. A Geography of India in greater or less detail.

3. That section of the subject which is sometimes called Physical Geography, but which is really concerned with the broad principles which underlie the whole subject; and

4. The outlines of the Geography of the World, usually with some special reference to the British Empire or to the relationships between India and the rest of the world.

The greatest variation is found in connexion with the last mentioned section; in some provinces roughly half of the middle school course seems to be devoted to World Geography, and the world must be covered more or less systematically. In the other cases, the amount of World Geography is much more of the order of that contained in the list already given.

Generally speaking, the important thing to remember in teaching middle school work is to adhere to those principles already laid down and to avoid the type of Geography which merely consists of learning facts.

Local Geographies have been written to cover most of the Provinces of India and will be familiar to the teachers in each of the Provinces concerned With regard to a Geography of the whole of India, there again the teacher has the choice of several good books. Whatever the book used both with regard to the province and to the whole of India, the teacher will be well advised to make use of the following sequence in the work carried out:—

1. Position and Size (including notions on latitude, longitude, time and area).
2. Physical Features (including mountains, plateaux, valleys, rivers, connexions with surrounding regions, contours, effects of physical features on man).
3. Geology and Minerals (including the work of rain and rivers, different kinds of rocks, volcanoes, earthquakes, useful minerals, soils)
4. Climate (Temperature) (including construction and use of thermometers, recording of temperature, taking of averages, temperature graphs, temperature maps, isotherms, variations of temperature).
5. Climate (Rainfall) (including measurement and recording of rainfall, averages, graphs, seasonal variation, rainfall maps and rainfall divisions)
6. Climate (Winds) (including land and sea breezes and monsoons and their causes, direction of wind, connexion between wind and rainfall).
7. Vegetation (including natural vegetation and its effects on the life of peoples, different types of vegetation and distribution, agriculture, crops and their distribution
8. Population (including occupations, distribution, density and causes, races, languages and religions).
9. Natural Regions (including definition, reasons for divisions, characters of regions).

The last-mentioned division is an especially important one. Nearly all regional Geography is now taught on the basis of natural regions In other words, the province or country or continent is considered on the basis of the regions into which it has been divided by nature This saves a tremendous amount of work, for one thing, Take, for example, the Thar Desert, which lies partly in Sind, partly in the Punjab, partly in Rajputana. We describe

it once as a single natural region, instead of mentioning it three times, as we should have to do if we described the provinces first.

It is much more difficult to suggest a small book for the middle schools dealing with the Geography of the world, since the books available have for the most part been written for use in England, and here the selection must be left to the teacher

Geography in the high school

Although a large number of children finish their education at the middle school stage and therefore whatever Geography is taught in the middle schools should aim at being complete in itself, the primary and middle school work is at the same time a foundation for the high school course. Consequently, the exact method followed in the high school course must depend on the work which has already been done in the middle schools. At the same time high school courses throughout India have this in common: at the end of the course there comes an important examination which receives different names in different parts of India, but which is essentially the same standard, whether we call it High School Final, School Leaving Certificate, Secondary School Leaving Certificate, or Matriculation. Except to those fortunate ones who go on to the university, where they probably will do no more Geography, this examination represents the culmination of the boy's or girl's education, and it must always be a definite object to be borne in mind to make the work done in the high school course something which will be really complete in itself and which will be really useful in after life.

Although the wording of the high school syllabus may vary somewhat widely in the provinces, it comprises roughly four sections:—

1. A general knowledge of the physical basis of Geography, that is to say, Physical Geography.
2. A general knowledge of the world, usually with special reference to the British Empire and to some of the more important countries of the world such as the United States of America.
3. Special knowledge of India and Burma
4. A good knowledge of maps.

Some of the syllabuses divide up the work into sections which are labelled Physical Geography, Political Geography, and Commercial Geography, but this division into sections rather suggests that Geography can be divided into watertight compartments and that each section is taught separately. This is an old-fashioned idea, and we realize to-day that the economic geography of a country is the direct outcome of its physical geography, and so the separation into these distinct divisions and especially the use of separate textbooks for each part is very much to be deplored. It is far better to frame the course and to use a book or books which regard the subject as a concrete whole

India now has three books specially written for Indian conditions which embody the modern point of view and treat Geography as a complete unity. The teacher must therefore be allowed to select between these three, which are as follows. *Our World*, Cameron Morrison (Macmillan), *The World*, L. D. Stamp (Longmans), and *The World*, by Herbert Pickles (Oxford Univ. Press). The first of these is the oldest. It is illustrated with a large number of pictures, but perhaps some of the maps in it are rather too

difficult for the average school pupil. The second is by the author of this chapter who naturally cannot say very much about it, except to mention that it concentrates on a very large number of simple maps rather than on a lengthy text. The third is a shorter book and hence rather less advanced in its scope

We shall have something to say presently about the great importance of sketch maps and practice in drawing of sketch maps, but we must also notice here that it is absolutely essential for every high school pupil to possess and to use a good atlas, and in this respect it is difficult to beat Bartholomew's *Indian School Atlas*, published at the modest price of R.1 As. 6, by the Oxford University Press, whilst practice in the interpretation of maps of all kinds and of climate data, etc is given in Longmans' *Geographical Exercise Books for Indian Schools*, Parts I, II and III, price As. 12 each.

Map work

It is extremely difficult to emphasize sufficiently the tremendous importance of map work in Geography. It was Sir Halford Mackinder who was responsible for the statement that 'the map is the tool of the geographer', and it is not too much to say that from the point of view of the Geography teacher no lesson is ever complete without map or diagram. It should be the function of the map to summarize the main points of each lesson. The pupil may apply the principle to himself when it comes to the examination, by seeing that very few examination answers are ever complete without a map or diagram. In any case, teacher and pupil must realize the fundamental truth that Geography without maps is meaningless. More can be expressed in one simple map than in pages of writing or in volumes of speech. We may divide maps in schools into several categories.

1. Maps for young children

Children in the primary school stage are usually best able to appreciate what are often called 'picture maps'. In such maps the outline of the country or district is drawn and the most important features represented by little pictures. For example, the position of ranges of mountains is indicated by actually drawing in brown or some other colour the line of mountains; areas of desert country can be represented by putting in yellow for sand and drawing a picture of that ship of the desert, the camel. Areas of forest country may be represented by drawing some trees, together with some characteristic animal such as a monkey. The important point is that even such simple maps do convey some idea of precision as to the regional locality where specified natural features or products occur. From such simple picture maps the next stage is to a simple and brightly coloured physical map, where the lowlands are represented by green, the uplands and intermediate areas by yellow and the mountains by brown. It may perhaps be stated there that the number of people who never learn to read a map is extraordinary. There is a true story which has been told many times, but which will bear repetition, and refers to the adventures of three soldiers who had lost their way. They discovered what they thought to be a map, and attempted to find their way by means of the red lines marked thereon, which they fondly believed to be roads. It is not recorded whether they ever found their destination, but their 'map' turned out to be a chart of the veins and blood-vessels of the human body. To prevent such things

happening in the future it is essential that in the very early stages in Geography, the idea of the meaning of a map should be thoroughly familiar.

Different teachers have different ideas of how map-reading should first be introduced. A very excellent scheme, where it can be carried out, is to start from photographs of certain well-known landmarks, and then to show a photograph of the same objects taken from an aeroplane, then a photograph technically known as a 'vertical' photograph, taken from an aeroplane but looking directly downwards, and then from this photograph to take a map of the same area. Even in India most children will have seen an aeroplane, and the idea of going for a flight in one and watching the earth below will appeal to their imagination. This serves to arouse their interest, and is a very useful way of introducing the idea of a map.

Quite a good exercise with small children is to get them to draw a picture of their own village as they think it will appear from an aeroplane. The results will usually be amazing, but the exercise is a very instructive one. This leads us on to the second type of map to be considered.

2. Local large-scale maps

Every school should possess at least the local sheet of the one inch to the mile map published by the Survey of India. It is a good idea to hang this map up in the classroom and to mark on it the school buildings and any well-known landmarks in the vicinity The children should also be given practice in working out walks from one place to another which they know well, on the ground, and identifying them on the map.

3. Wall-maps and black-board maps for classroom use

One of the expenses which every school simply must face is the provision of at least some good wall-maps for teaching purposes. If it is only possible from the financial point of view to purchase one series of maps, let that series be physically coloured maps, showing at a glance where are the plains, the plateaux, the mountains of the country Again this is a point which cannot be too strongly emphasized, because the majority of schools in India are still using the old-fashioned political maps, on which the mountains are indistinctly marked by hairy lines, which are often rightly nicknamed 'caterpillars'. Most of the wall-maps which are offered for sale in the shops of India are still the maps of this character. There is the added difficulty that it is often impossible to obtain any other type of map where a wall-map in the vernacular is required, but we simply must have physical wall-maps for teaching. With the majority of these maps nothing is lost because the political boundaries are shown on them also.

For a single series of good coloured maps of the continents, perhaps the best is that known as W and A K Johnston's Bathy-Orographical Series of Wall-Maps (North America, South America, Europe, Asia, Africa, Australia and India). Macmillan & Co are the agents for India. The total cost of this set would be about Rs 75. Almost equally good are the physical maps selected from a series known as Philips's Comparative Wall Atlases (World Relations, North America, South America, Europe, Asia, Africa, Australia, Indian Empire) The agents for these in India are Longmans, Green & Co., Calcutta, and the total cost of the set is about Rs. 46. For the school which has a little more money to spare a good investment is a complete set of Philips's Comparative Wall Atlases. Each set consists of eight maps, and

may be obtained mounted on linen to fold, or mounted on rollers and varnished. The eight maps are as follows: Physical, Political, Temperature, Summer Conditions (rainfall), Winter Conditions (rainfall), Natural Vegetation, Density of Population, Commercial Development. Each map is of the same size, so that two or three may be hung side by side for demonstration purposes. They are not all equally good; some are too crowded with detail, but the teacher can use his discretion in eliminating a few of the more complicated maps, as on the whole the sets are excellent.

With regard to blackboard maps, to save the trouble of drawing outlines it is possible to purchase, at the very low price of one rupee, the outline maps of the provinces of India, printed in red on large sheets of black paper. These maps are published by Longmans, Green & Co., under the title of 'Longmans' Map-Building Sheets'. Similar outline maps of India, each of the continents and many European countries may also be purchased. If the teacher feels able, of course the use of these may be entirely dispensed with and outlines drawn in chalk on the blackboard, but whether a blackboard or a printed outline is adopted, the all-important point is the use of coloured chalks. It is a great advantage for the teacher actually to construct a blackboard map in colour in front of the class, so that they may follow stage by stage the building up of the map. Suppose a lesson is on physical features and railway communications; on a white outline the lowlands are shown in green, the uplands in yellow and the mountain ranges in brown. The railways can then be inserted in bright red lines, and the children will see how in building a railway the lofty mountains have been avoided and that the railways follow, where possible, the lowlands and the valleys

Another rather ingenious system has been adopted for blackboard maps, it is possible to purchase sheets of cardboard showing the country itself cut out of the centre, so that the sheet of cardboard may be pinned on the blackboard and there is left in the centre a black, empty space on the board the same shape as the country.

4. Atlases

Under the heading of maps we come to the subject of atlases. In the first place every single child from the middle school upwards must have an atlas. It is not a luxury, but an absolute necessity We should like to print this statement in large type, because so often a school possesses but one or two atlases which are even then but infrequently used. There are many atlases in use in India, good, bad and indifferent. The usual trouble is that the maps are not physical maps. We have already pointed out the excellence of Bartholomew's *Indian School Atlas* in which the principal maps are physical maps, boldly coloured and not overburdened with names, but an atlas in which the political geography is not neglected. A new atlas of rather different character which includes brightly coloured maps showing details of climate and economic geography and natural regions with other subjects, is published by Messrs. George Gill & Sons under the title of *A Junior School Atlas*. For teachers and possibly for students in normal schools who are going in for teaching, the standard atlas is *The Oxford Advanced Atlas*, published by the Oxford University Press at the price of Rs. 7 As. 8, whilst another good one in the same category is Philips's *Senior School Atlas*, to be obtained from Longmans, Green & Co.

Of course practice in reading of maps must be given at all stages, and

in this connexion we may refer again to Longmans' Geographical Exercise Books. 'Map drawing' in schools of a generation ago used to take up one or two periods a week. In far too many schools in India 'map drawing' is treated as a special exercise, even as a subject entirely separated from Geography at the present day. The 'map drawing' book, if neatly kept, is always a useful standby to bring out when the inspector visits the school, and the inspector is perhaps rather apt to be impressed by a voluminous or beautiful 'map drawing' book which contains a number of neat maps of India, Burma, Asia, etc., the drawing of which, unfortunately, has probably been merely a mechanical exercise Many and many a time I have seen detailed maps in the 'map drawing' book showing perhaps twenty or thirty lines of latitude and longitude, and yet have discovered that the children themselves have not the faintest idea as to what these lines mean. It is true that map drawing of this type may help a child to remember the outlines of a country—that unfortunately is its principal value In reality the drawing of maps should be part of every Geography lesson, and the maps should nearly always be of the type of simple sketch-maps.

What, first of all, are the requirements of such a map? First of all, just two or three principal lines of latitude and longitude should be selected as guide lines. Take a map of Africa for example. The equator runs through the continent almost exactly half-way between the north and south coasts. The Tropic of Cancer runs through the great northern deserts, the Tropic of Capricorn through the south of the continent, while the middle line of longitude passing right through the continent from north to south is 20° E These few lines may be used as guide lines and the outline of the continent fitted into them. The use of lines of latitude and longitude in this way will impress on the mind of the pupil the position of the area studied in connexion with the world as a whole. It is a great mistake to use an artificial system of squares and triangles as a guide in the drawing of an outline of the country.

The great lesson to be learnt in the drawing of sketch-maps is simplification. Broadly speaking, the small indentations of the coast lines are not of any great importance. Much more significant is the general shape of the country. The boy or girl who tries to fit in every single curve of the coast nearly always gets the shape of the country out of proportion. Similarly with physical features and indeed with any other features to be represented, they should be simplified. Here again must be stressed the importance of colour; the use of coloured pencils is of the greatest importance If we look at almost any atlas map, it obviously contains far more information than any child can possibly remember. Hence, when it comes to the drawing of a sketch map, just the salient points should be emphasized

Take the excellent example of a temperature map of North America for the month of January, showing a large number of isotherms crossing the continent: perhaps isotherms for every 5° or 10°. But the really important thing to notice is that portion of the continent which is below freezing in January; hence a simplified sketch-map need only show one or perhaps two isotherms, and this will divide the continent into two parts, the part which is below freezing and the part which is above freezing in January. Similarly, with a rainfall map of India, the really significant lines are the 20", 40" and 80" lines. Special difficulties often arise in the teaching of

maps in connexion with contours, and here reference may be made to the construction of models

The Geography lesson

It is of course impossible to lay down any fixed rules with regard to the sequence to be followed in an individual Geography lesson The order must of necessity depend upon the age of the children and the subject matter under consideration. In the primary school it must first be the object of the teacher to arouse interest, and therefore the work is not presented in the same logical sequence as should be the case in the high school We have already dealt with the use of objects and the advantages of object lessons or of lessons based on models made by the children themselves

In the middle and high schools, on the other hand, the sequence of work may be made much more logical, that is to say, the child should be trained to understand the way in which one thing depends upon another, how the physical features and the climate of a country, as we have already indicated, determine to a very large extent its general geography Particularly is this the case in the high school work To give an example, when teaching the geography of a large area such as a continent, the lessons should follow approximately the order given below —

1. The position, size and shape and the world relations of the area, the class to be made familiar with the outline of the area and with its position in the world as a whole

2. Physical features, i e the general build of the area, position of mountains, plateaux and plains, chief rivers, illustrated by simple physical maps

3. Geology and minerals, a very little of the geology to be taught, just sufficient to show the relation between structure and surface.

4. Climate, including temperature, winds and rainfall

5. Natural vegetation and the way in which it depends upon climate. Under this heading should be included also crops and types of agriculture

6. Animals, including both wild and domestic animals

7. Natural regions, into which the area is to be divided

8. Population, including the distribution, occupations and races of man

9. Political divisions.

10. Communications, commercial development, including principal towns, manufacturing areas and ports

A similar sequence should be followed in teaching the geography of a country or of a small area In framing a single lesson the greatest care should be taken first to ensure that the children are familiar with the necessary groundwork, and secondly not to introduce too much new material A good general scheme for a single lesson is as follows :—

1. A brief revision of the previous lesson in all those cases where the present lesson is a logical outcome of work already done; for example, if the lesson is to be on the natural regions of a country, this depends so much on the climate, physical features and vegetation that a revision of the previous lessons on those subjects is an essential basis. A good method of spending the first quarter of the lesson period is to carry out this revision by means of questions round the class

2. The new matter should then be introduced As far as possible bring out the new points by putting leading questions to the children and

getting them to suggest the new matter. A little well done and carefully thought out is far better than hurrying over a lot of new ground.

3. The lesson should be concluded by summarizing the new work by the help of a blackboard sketch. The children copy it as the teacher draws it on the board, thus gaining a permanent record of the lesson as a sketch-map, perhaps with three or four sentences as a summary of the work.

In arranging a lesson in this way there is, of course, the ever-present danger of the bright boy or girl in front of the class doing all the work and making all the answers. This must be carefully avoided by asking questions round the class. Elicitation of information from children is sometimes carried out by the teacher giving a sentence and allowing the class to supply the one final missing word. This exercise tends to be rather mechanical and is not always conducive to careful thinking by the children.

The Geography room

In those schools where the teaching of Chemistry of Physics is undertaken, it is an understood thing that a laboratory is an essential. With certain other subjects it is particularly desirable to have a special room set apart, and amongst these subjects Geography has a very strong claim for a separate room. We know that it is an impossibility in many schools to set aside a special room in this way, but in any case there should be one classroom which is recognized as the place where any special geographical material should be kept.

We have already stressed the essential importance of wall-maps, the necessity for a globe, the need for local maps as well as for materials for making models, and all these things must be kept somewhere ; so whether we call it a classroom or whether we dignify it by the name of the Geography room, there should be some recognized portion of the school building set aside for the storage of such materials. If there is a possibility of having a classroom specially adapted for use as a Geography room, the opportunity should be taken of having it fitted with flat-topped desks or benches with moveable stools. This makes it easier for senior classes working with maps, but it is really only a secondary consideration and the ordinary forms usually serve.

Turning now to the contents of the Geography room (see also Note, p 181), which we may refer to alternatively as the apparatus necessary for teaching Geography in middle and high schools, we can list these contents under the following headings :—

1. Wall-maps
2. Globes

Details of wall-maps have already been given. Nor should any school ever be without a globe. We get so familiar with dealing with maps on flat surfaces which can never be a true representation of the surface of a sphere, that we must rely very largely on the constant presence of a globe to remind us that these maps are after all only indifferent attempts to represent the impossible A friend of mine who was a geographical enthusiast and the headmaster of one of the largest Anglo-vernacular schools in India, had a Geography room, and at one end of it a huge globe, more than four feet in diameter. This was suspended from the ceiling and boldly painted with the continents in white and the oceans in black. He got it constructed by a local blacksmith out of old zinc sheets for a few rupees, and the painting of the surface was carried out after school hours by some of his boys. If one has to buy a globe, they tend to be rather expensive, and the largest

that one can conveniently obtain has a diameter of about 12″ or 14″. A useful globe is one physically coloured in good, clean, bright colours. Another form of globe which is very useful in teaching is a black and white globe, since winds, ocean currents, etc., may be marked on the black surface in coloured chalks.

3. Local small-scale maps

As already mentioned, every school should possess at least one, preferably several, copies of the local sheets of the map published by the Survey of India on the scale of one mile to the inch The other maps published by the Survey of India on the scales four miles, sixteen miles and thirty-two miles to the inch should also be obtained, whilst a really magnificent physical map of India on the scale of thirty-two miles to the inch is supplied mounted as a huge wall-map by the Government Map Depôt, Calcutta, for the really quite modest price of Rs. 36. It is too large for most ordinary classrooms, but is a really fine addition to the proper Geography room or the school library.

4. Meteorological instruments

Every year in the various high school examination papers in the various provinces of India, we find questions on temperature and pressure and rainfall. Although students learn in their textbooks how temperature and rainfall are measured, unfortunately many of them have never actually seen the instruments which they describe. It is to be feared that schools do not pay nearly enough attention to what is laid down in the syllabuses The syllabus for standard 3, middle school, for Bombay lays down that the work should include observation and keeping of records of the thermometer readings at noon once a week, and the use of the raingauge and the keeping a record of the rainfall of the place, whilst standard 4 lays down that the students should learn to read a barometer. Now of course these instructions cannot be carried out unless the school possesses the necessary instruments It is therefore highly important that the simple instruments should be on view and in constant use in the school. It is no good having them in a cupboard to be brought out occasionally. If they are hung up on the walls in conspicuous positions, curiosity often leads the boy or girl to have a look at them and to see how they work. The following instruments are the essential ones :—

(a) An ordinary Fahrenheit thermometer, or one graduated with both Fahrenheit and Centigrade degrees, to be obtained at any chemical stores for a few rupees.

(b) Maximum and minimum thermometer. There are several different patterns, but it is a great advantage to have at least one so that a record may be kept of highest and lowest temperatures reached in a day or any given period

(c) A wet and dry bulb thermometer, another simple instrument not costing more than a few rupees.

(d) A barometer. Unfortunately a barometer of the type usually described in the textbooks is much more expensive to obtain, but an effort should be made to do so.

(e) Simple raingauge. Although self-recording gauges are now widely used in rainfall stations, the old funnel type is the most useful for school demonstration purposes and may be obtained quite cheaply.

(f) In addition to these meteorological instruments every school should possess a compass of some kind, and if possible, a wind vane

5. Astronomical models

Amongst the difficult tasks which confront the geography teacher is that of teaching such things as the motions of the earth and the sun, and although models can be purchased to illustrate these phenomena, the teacher can make much better models than he can buy.

(a) Model to illustrate the comparative size and positions of sun, earth and moon. Other planets may be added if desired. A large wooden ball coloured gold or yellow represents the sun; at the other end or opposite side of the classroom a pin with a large head to represent the earth and a pin with a small head to represent the moon. The teacher may work out the exact sizes from the following figures:

Diameter of sun	867,000 miles.
Diameter of earth	8,000 ,,
Diameter of moon	2,160 ,,
Distance sun to earth	93,000,000 ,,
Distance earth to moon	240,000 ,,

(b) Model to illustrate the motion of the earth round the sun. The sun may be represented by a lamp or an electric light in the centre. A small globe, correctly inclined, may be carried round the sun to illustrate the earth's annual passage round the sun. Great care must be taken to keep the earth's axis always inclined in the same direction. A more permanent model may be made, if space permits, with four wooden balls such as polo balls. On the balls should be marked the equator, the tropics, and the Arctic and Antarctic circles. The balls may be bored through by a red-hot wire to represent the earth's axis, and the four balls may be arranged round the central light (sun) to show the position of the earth at the equinoxes and the two solstices. Great care must be taken to keep the correct inclination of the earth's axis to the plane of its orbit. This same model may be used to illustrate the phenomenon of day and night, and the addition of a moon in its correct proportions will enable tidal phenomena, the phases of the moon, eclipses and other matters to be demonstrated.

6. Specimens

Amongst the specimens which it is particularly important should be used in the teaching of Geography are simple rocks and minerals. As a rule the constant reference in books to such things as sandstone and limestone and shale convey very little indeed to the average child, and what is required is a set of specimens of just the common, typical rocks which make up so much of the earth's crust. Two collections for Geography teachers, together with descriptive booklets, have been made up by Messrs. Thomas Murby & Co, 1 Fleet Lane, London, E.C.4. In addition the children themselves should be encouraged to collect specimens of local interest. There is no end really to specimens which are of use in the study of Geography, but we will deal with this question separately under the heading of the school museum.

7. Relief models

Relief models tend to be expensive and must be regarded in the nature of a luxury, but they are very useful indeed where funds are available. Energetic teachers will make their own models from clay or cardboard. Clay has the disadvantage that it cracks badly, and in this connexion a good investment is a quantity of plasticine, which may be made into models of permanent value.

8. A lantern and lantern slides

It is impossible to deny the value of a lantern where this possession is a possibility, and the same applies to the cinematograph for school use. Again, where funds are available nothing can be more useful than an epidiascope: that is an instrument which can be used for reflecting on a screen drawings of maps, and at the same time can be converted into an ordinary lantern. It is obviously of the greatest advantage to be able to throw on a screen any picture or map from a book, whereas a lantern requires special slides to be made. A good epidiascope costs Rs. 400 or Rs. 500.

School museum and library

In the last section we dealt with the apparatus which is essential in the teaching of Geography and should be kept in the classroom or in a special Geography room. Alternatively, or in some large schools in addition, there may be a school library and museum. In several large Anglo-vernacular schools in India the museum has been made part of the Geography room with very excellent results.

Taking the museum first, the object of the collection should be to turn the collecting instinct which is so strong in every normal boy or girl into useful and profitable channels. Invaluable as a school museum may be in bringing home to every child the close connexion between school lessons and everyday life, it is very much neglected in most Indian schools. It is or should be the special concern of the Geography teacher. It is impossible here to indicate the full scope or the varied objects which may be included in the collection of a school museum, but among the more important classes of objects with a definite value in geographical teaching we may note the following:—

1. Pictures, picture-postcards, illustrating the life of the people and places in other lands, or in other parts of India. This collection can be added to by a large number of children, who will thereby have a personal interest in the museum.

2. Models, either made by the children or obtained by them, again illustrating the life of the people at home and abroad.

3. Articles of local manufacture, such as cloth, pottery, brass and other metal work, basket work, paintings, lacquer work, etc.

4 Specimens illustrating local agriculture, different kinds of rice, millet, wheat, peas, oil seeds, fibres, etc

5. Different kinds of rocks, stones, minerals, etc. In this category it is very important that each specimen should be labelled with the exact place from which it was obtained, and as far as possible with a careful description.

6. Foreign stamps, coins, etc.

It is essential that the school museum should not be primarily the teacher's concern. Every boy and girl in the school must feel a personal interest and a personal responsibility in it for it to be a success. A school museum is likely to flourish best under the management of a museum committee, elected from amongst the pupils and working under the guidance of a sympathetic teacher. Every boy or girl knows a natural pride in an exhibit labelled 'Presented by . . .' and there is no reason why the museum should not grow rapidly.

Combined with the school museum or the Geography room should be

the school library. In the first place, we feel it is essential that such a library should not be stocked purely with textbooks, or indeed mainly with textbooks. As far as the geographical section is concerned, well illustrated books of travel and well illustrated descriptive books should occupy the first place. Again, the library should not be too closely guarded. It is difficult to overemphasize the educational importance of encouraging the child to 'browse' in a library, that is to say to wander round in a spare ten minutes and to take a look through some of the books The books which will first attract are those full of pictures. The pictures will arouse an interest in the letterpress, and thus lead to spontaneous reading. Whilst the library should be stocked for the benefit of the pupils, it will prove equally useful to the teacher.

Obviously it is impossible here to suggest books for the school library, but amongst extensive series we may mention such as 'Peeps at Many Lands' Series, published by A. & C. Black, Ltd., at 2s. 6d. each. Each of these books is illustrated by eight or more coloured plates and is a simply-written account of the country with which it deals. A larger and more elaborate series issued by the same publishers at 7s. 6d is known as 'Black's Colour Series'. Similarly there are Black's 'Pictures of Many Lands'. Another excellent series published by Seeley Service & Co is the 'Things Seen' Series. Amongst magazines of special value may be mentioned the *National Geographic Magazine*, published by the National Geographic Society of America, Washington, U.S.A. It is issued monthly at a cost of about Rs. 12 a year, and is one of the most beautifully illustrated periodicals in the world. For Indian pictures the *Times of India Illustrated Weekly*, published in Bombay, has many good pictures and is a useful addition to any library. In connexion with magazines, may be mentioned the publication of very great importance to teachers known as *Geography*, which is distributed free, four times a year, to members of the Geographical Association (11 Marine Terrace, Aberystwyth, Wales), the subscription being five rupees.

Examinations

The examination is usually the bugbear of every school teacher, yet unfortunately very few teachers realize that the failure of their pupils in an examination is due very, very often not to their lack of knowledge nor to any lack of ability of the pupils to express themselves (in the case of the high schools) in the English language, but merely to an ignorance of how to answer the questions. Candidates need very careful instruction and practice from their teachers in the art of answering examination questions. Every examiner who has worked long in India can tell of the long uninterrupted succession of failures from one school, side by side with an almost uninterrupted succession of passes from another, showing that too often the examination is testing the teacher and his methods much more than the children.

In the first place it is amazing how few candidates take any notice of the all-important instructions at the head of the paper. Usually these instructions state the number of questions to be attempted and it is an obvious deduction that if five questions are to be attempted and the maximum for the paper is 100 marks, each question will be allowed 20 marks. Therefore the boy and girl who spends three-quarters of the time answering one question

and leaves only a few minutes for the others cannot hope to pass. It is important that the time allotted should be distributed as equally as possible among the five questions. The notes at the head of the Geography paper nearly always state that sketch-maps and diagrams must be used This is a direct command and disobedience will incur serious penalties. It means that if maps are not used full marks cannot be given. Indeed many examiners give a maximum of half marks only to papers in which maps are not attempted.

The questions in an examination paper are framed so as to cover as wide a ground as possible to give everyone a chance, and also to test not only the actual knowledge possessed by the candidate but his powers of thought. All examiners try to set questions which cannot be answered by phrases remembered and repeated from a textbook. There is a true story of a boy who, in answer to a question, put down the following : ' The answer to this question is a long one. It will be found on pages 256-59 of my textbook, and it is illustrated by three maps.' He was surprised when he learnt that he had not been awarded any marks for his intimate knowledge of his text-book.

Candidates also seem to forget that the examiner is a busy man and does not like to have his time wasted. Nothing will make him more angry than pages of introduction which mean nothing, and page after page perhaps with a few words scrawled on each and then marked ' P.T.O.' It is perhaps one of the most prevalent and at the same time one of the most dangerous diseases to which examination candidates are subject to want to fill up a lot of answer books. I have known boys in the High School Final send up as many as five answer books pinned together, yet containing so little matter that they were a very long way from the pass mark. In one year for the High School Examination in the Province of Burma, the highest marks, 92 per cent, were awarded to a girl who answered the whole paper with the aid of very careful sketch-maps in only six pages.

Many candidates, either accidentally or on purpose, do more questions than they are asked. Some examiners are kind and say that the candidate has made a mistake and so they just cross out the extra ones. Another examiner may be very angry and say ' Here is a candidate who is trying to deceive me and score extra marks ', and so he may cancel the marks for the best answer by way of punishment.

Finally, we cannot stress too much the importance of sketch-maps in answering examination papers in Geography. In setting the paper the examiners have probably allowed that half the time available should be spent in this way, so that time spent in drawing is not wasted It is very funny, however, how many boys and girls when they come into an examination room think that the proper implement for drawing sketch-maps is a fountain pen which has a broad nib—probably crossed—and which leaks badly. The results are usually beyond description and so smothered with blots and smudges that it is impossible to tell whether the candidate really does know the answer or not. A Geography paper cannot be answered without the proper implements. They are quite simple—a lead pencil (*not* an indelible one), a short ruler, coloured pencils (blue, green, yellow, brown and red) and perhaps a compass. With these every boy and girl should be able to show all that he really knows about the subject matter of the question.

Conclusion

In writing this chapter I have attempted to avoid theory and to be essentially practical the whole time. The points emphasized are those which struck me as needing emphasis during the years which I spent in India. During that time I examined over 5,000 answer books of all standards in public examinations, from middle school to university degrees, and during that time visited many rural schools and inspected large numbers of middle and high schools, so that the principles laid down above are those which refer primarily and essentially to Indian conditions. Especially should care be taken with the primary school work, since so many children through the length and breadth of India cease their education at this stage, and it is these children who should be given some basis of education which will remain with them all their lives. For it is they who will come in contact with the vast number of India's illiterates and have it in their power to do something for the cause of advancing literacy in India.

NOTE ON THE EQUIPMENT OF A GEOGRAPHY CLASSROOM

It seems of greater practical value to describe how, without great expense, an ordinary classroom has been adapted and equipped for use as a Geography room than to describe from imagination an ideal Geography room. A description is, therefore, given below of the Geography room of Spence Training College, Jubbulpore Every Geography teacher may not be fortunate enough to have at his disposal a special room, but many of the features described may be adapted for use in an ordinary classroom

The dimensions of the room are 30 by 20 feet. The wall on the north side has two doors and two windows and that on the east side two doors and one window. The south wall has two recesses in which are placed cupboards and the west wall has a blackboard running along its whole length. Below one end of the blackboard against the wall is a cupboard, 6 feet long, 3 feet high and 1 foot deep with sliding doors fitted with wire netting On the shelves are specimens of local rocks, such as granite, basalt, sandstone, limestone and marble. Below the other end of the blackboard is a small cupboard for the magic lantern and the opaque projector

The map cupboard is in a recess in the south wall. It is $5\frac{1}{2}$ by $4\frac{1}{2}$ by $1\frac{1}{2}$ feet in size and contains forty maps Hooks are screwed from below into the top of the cupboard and maps are suspended from these by means of hooks screwed into the ends of the rollers. The hooks in the cupboard are arranged diagonally in rows of four, so that the title of each map can be seen. A description of a map cupboard of this kind will be found in Fairgrieve, *Geography in School*, page 207. Its advantages are that maps can be kept clean and free from dust, that it takes up little space and that any map can be readily found In a prominent place on top of the map cupboard is a globe.

The other recess in the south wall also contains a cupboard similar to the map cupboard, but fitted with shelves on which are kept geographical pictures, many of which have been mounted on cardboard or three-ply wood, lantern slides, and apparatus such as an orrery, a mapograph set, a wire globe, a circular blackboard protractor, a blackboard ruler divided into a hundred parts for drawing percentage diagrams Here also are large stencils of the continents to assist teachers in drawing outlines rapidly on the blackboard. These are made of tin or three-ply wood with one or two wooden strips screwed on to keep them rigid Small stencils are also kept for distribution to a class for drawing outlines in their exercise books The stencils, protractor and ruler were made in the college manual training centre

A picture rail runs all round the room just above the tops of the doors and windows, except where a white square is kept for use as a lantern screen On the rail rest framed pictures of geographical interest Below the rail are hung some good maps drawn by students. Two large maps are hung on the south wall, one a map of the world and the other the excellent map of India on the scale of thirty-two miles to an inch published by the Survey of India Map Record Office, 13 Wood Street, Calcutta On the east wall

are hung for storage Philip's Comparative Wall Atlases of each of the Continents These cannot conveniently be rolled up, as there are several maps on each roller.

In order that the room may be darkened quickly for the use of the lantern or projector, the doors are fitted with wooden panels instead of glass panes and curtains are fitted to the windows. The clerestory windows are fitted with black tin sheets, one overlapping the other, so as to admit air but not light. To diminish the amount of reflected light the walls are colourwashed, except for a patch 8 feet square, which is whitewashed and used as a lantern screen Facing the blackboard one finds that the students' seats are not placed centrally but rather to the left This is to make room for the lantern which is usually placed about 18 feet from the blackboard on a stand about 4½ feet high The picture is projected on to the white square above the blackboard Illumination is obtained from electric current or from the sun's rays

The advantages of the sun's rays are that they are the most powerful illuminant available and that they cost nothing To use the sun's rays a mirror is placed outside the room in such a position as to reflect the sunlight through a partly open door on to a whitewashed wall or screen The mirror should be adjustable, and must in fact be adjusted as the position of the sun changes In addition to the mirror and the screen the only things necessary are a lens, fitted to a window in a cardboard or metal sheet, and a slide carrier. An old lantern can easily be adapted for the purpose by removing the bulb or burner and one of the lenses The beam of light is thrown from the mirror through the slide and lens on to the screen

For the projection of opaque objects, such as picture-postcards and small pictures, the Universal Projector, supplied by the Times of India Press, Bombay, although costing only Rs 275, has been found very useful. For this projector electric current is necessary. The projector is placed in a corner of the room near the blackboard and a translucent screen about 6 feet in front of it A better screen than that provided with the projector is the 'Translux' screen made by the Central Scientific Co, Chicago (agents: The Scientific Instrument Co, Allahabad) This screen, however, costs with stand about Rs 100. Alternatively the projector may be placed about 6 feet from the wall and tilted up so that the beam is thrown on to a whitened cloth or canvas screen above the blackboard In this case the screen has to be tilted so that the beam meets it normally. A screen in a frame about 2½ feet square will be found suitable

The observatory is situated out of doors near by and may be considered an adjunct of the Geography room. It is a small plot enclosed by a railing and contains a Stevenson screen and a raingauge In the Stevenson screen are kept the maximum and minimum thermometer and the wet and dry bulb thermometers The barometer is kept in the Science laboratory and the wind vane can be seen on the roof of the college Every day in turn the students take the usual readings of the weather and these are posted on the Weather Report Board, where also the monthly graphs are kept up to date

The Geography room described is by no means perfect, but it has been found a great convenience for the teaching of Geography and improvements may doubtless be contrived as time goes on

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CHAPTER 10

THE TEACHING OF PHYSICS AND CHEMISTRY

Claims and aims

The claim of Science for a place in the school curriculum has been so firmly established, that few people nowadays would dispute the claim. This was not always so. So general has been the acceptance of Science as a school subject, at least in theory, that we are apt to forget the struggle through which it passed before being admitted to the society of approved knowledge. It is an interesting fact, however, that most of the reasons that were then advanced, and accepted, for the inclusion of Science in the school programme of studies would be considered invalid to-day. That being so, it may be profitable for us to ask, once again : ' Why do we teach Science ? '

We teach Science, just as we teach Mathematics, partly because of its usefulness, partly because of its discipline and partly because of its cultural value. Briefly expressed, our aim in teaching Science is *utilitarian, disciplinary* and *cultural.*

The first of these needs no elaboration. We live, move, and have our being in a world in which Science has become, for better or for worse, an inseparable element Daily contact with the modern world makes some acquaintance with the facts and conclusions of Science almost imperative.

Mental discipline may be expected from the Science lesson only when the pupil consciously proceeds in a scientific manner and consciously accepts such procedure as a desirable ideal. For example, habits of accuracy acquired in the Science classroom carry over into life only when they are consciously accepted as ideals and followed as principles of life. It is possible for us to be accurate in the laboratory and inaccurate everywhere else The emphasis must be placed on rational methods of learning and right attitudes and ideals.

The cultural value of Science is only being slowly recognized In the past Science teaching has been too closely concerned with factual knowledge and too little concerned with the great fundamental concepts and principles of Science. The teacher who has not lifted his pupils above the tangible and immediate, who has not excited in them feelings of wonder, admiration, even of reverence, in the presence of nature, has surely missed a great opportunity. Science rightly taught may justly claim a place among those cultural subjects of the school curriculum which do so much ' to enlarge, enrich and ennoble life '

Methods

The aims of Science teaching that we have discussed naturally suggest certain methods of instruction. If our aim is utilitarian, our methods will be essentially practical ; if disciplinary, they will emphasize observation and thinking ; if cultural, they will bring to the fore the big ideas of Science rather than the details which exemplify them. There has been much debate in educational circles as to whether Science teaching should be practical *or* cultural, experimental *or* demonstrative, but there is really no conflict between these rival claims Effective Science teaching will be practical, intellectual and comprehensive at

the same time. Let us now proceed to discuss some principles of method in support of this claim.

Science and life

Present-day Science teaching is reflected, in some measure at least, in school textbooks, which are in striking contrast to those of twenty-five years ago. To-day the treatment is psychological rather than logical. The content of the Science course and the method of presentation are more closely related to the interests and needs of the pupils and to their everyday experiences than ever before. Thus Science in schools has become less academic but more practical, less systematic, perhaps, but more closely connected with life.

The heuristic method

The word ' heuristic ' is derived from the Greek word ' heurisco ' (I find out). The heuristic method is one which leaves the pupil to find out things for himself Professor H E. Armstrong, the first advocate of the method, thus describes it : ' Heuristic methods of teaching are methods which involve our placing students as far as possible in the attitude of the discoverer—methods which involve their *finding out* instead of being merely told about things.' It is easy to criticize such a method, for it is obvious that the school pupil cannot reproduce the scientific history of the race, but there is no doubt that Professor Armstrong has done signal service to the cause of Science teaching by insisting that the child should be placed ' in the attitude of the discoverer ', that he should, whenever possible, stand where the original discoverer once stood There are many scientific truths that can be found out by a child with little or no assistance from the teacher. Why deny him the pleasure of pursuit and the joy of discovery ? What a difference there may be in the mere statement of a problem ! One teacher asks his class to ' verify Hooke's Law ', another to ' find the relationship between the tension and extension of a spring '. The element of discovery is entirely absent from the first statement Who wants to verify laws ? Why not take them for granted ?

The scientific method

The heuristic method naturally implies the scientific method, in which we begin with a problem and work by rational means towards a conclusion. Let us suppose that our problem is to find the relationship between the pressure, volume and temperature of a gas. There are, in this problem, three variables. pressure, volume and temperature. We begin by reducing our variables to *two*, by keeping the temperature constant. We then vary the pressure over as wide a range of values as possible and note the corresponding variation in volume The numbers so obtained are then tabulated and depicted in graphical form. An examination of the line of best fit to the points of the graph suggests a law, which we state as part of the relationship sought. This procedure may be adopted in a large number of experiments in Physics. We have : reduction of variables to two, observation, tabulation of results, graphing of results, formulation of a conclusion or law.

Laboratory and demonstration

The rival merits of the laboratory method and the class demonstration have been the subject of much controversy in recent years. Some arguments have appealed to psychology, others to philosophy ; some have been supported by the fruits of experience, others by the results of experiment. But even apparently similar experiments may point to different conclusions. One

investigator proves that the laboratory method is better, another that the lecture is the more effective. How are we to decide between these assertions? It is obvious that there can be no 'answer' to a problem which has so many variables. If I assert that the lecture method produces better examination results and test my assertion with my own type of examination, I shall in all probability get the result for which I am looking. If I am prejudiced in favour of the laboratory and test only laboratory outcomes, I shall no doubt have my prejudice upheld. The fact of the matter is that there is no better or worse in the case; each method has its place in the Science classroom. The teacher, who has a comprehensive outlook on his subject, will not go to either extreme but will use the two methods in a happy combination.

The historical method

In recent years much attention has been given to the historical in Science teaching. Some teachers aim at little more than to 'humanize' Science by showing that all scientific achievement is the result of human endeavour, in which success and failure, honest purpose, strenuous labour and even self-sacrifice have been inseparable elements. Others urge that Science teaching should follow the order in which, all through the ages, investigators have worked in their pursuit of truth. This is called the 'recapitulation theory'. There is much to be said for both points of view. The history of Science is the history of men who actually lived, who were actuated by human motives and inspired by human ideals. What finer education for any boy or girl than to come in contact with men like Newton, Pascal, Faraday and Maxwell, and live for a while with them. The 'recapitulation theory' also has its advantages but they are more easily discernible in Chemistry than in Physics. To present a boy with the Atomic Theory 'full blown' without leading up to it through the laws of definite proportions, multiple proportions and equivalents, or to introduce chemical formulae before the substances themselves have been properly examined is fundamentally wrong. On the other hand, to spend days on the phlogiston hypothesis or on out-of-date chemical processes would certainly be unwise. The historical is not a method but an aspect of Science teaching.

Stages of development

We have urged that Science teaching should be brought into close touch with the pupil's everyday needs. It is still more important that it should be closely related to his condition of development. Food that is suitable for the growing adolescent would do harm to the very young child. So a method of presentation that would be suitable for the boy of seventeen would probably fail to satisfy a boy of eleven. While this is generally recognized, it is difficult to frame any kind of rule regarding stages of development for the guidance of the young teacher. The best that we can do is to suggest a sliding scale of values between the ages of eleven and eighteen. At the lower end of the scale we place the 'psychological', at the upper end the 'logical'; at the lower end the topical and factual and at the upper end the systematic and abstract. It is possible to distinguish in the secondary school period (eleven to eighteen) three stages, more or less distinct but certainly not sharply separated. The first is the spectacular and romantic stage, the second the utilitarian and practical, and the third the systematic and idealistic. These stages correspond in some measure to the scientific development of the race, from the primitive stage

of curiosity and wonder, through the more advanced stage of useful application, to the most recent stage of abstract thought and ethical ideals. The young teacher must bear in mind, constantly, that he is well on in the third stage and must resist the temptation to force his own mature point of view upon the young child. He should remember that he is not teaching 'Science' but is teaching 'John', of a particular age and living in a particular environment, to appreciate and understand Science.

The concentric method

If we acknowledge, as indeed we must, that there are stages in human development, we shall make it our business to vary our methods according to the age level of the child. We shall, if we agree with the above classification, plan our work in three sections. In the first of these section we shall discuss the subject in a broad, general way, making our presentation vivid and striking, in the second we shall examine more closely the reasons and explanations of observed phenomena and their practical applications; in the third we shall endeavour to systematize our knowledge into general principles. Thus we shall go over the same ground several times, each time widening our scope and broadening our conceptions. This is called the 'concentric', or better, the 'spiral' method of organization

The fundamental concepts of Science

The teacher of Science, as of any other subject, must take a 'long view' of his subject. He will often be tempted, under the stress of examinations or under the spell of a monotonous routine, to place too much emphasis on the knowledge of scientific facts and too little emphasis on the great concepts of Science, the 'big ideas' that govern scientific thought. It does not matter, in the least, whether a boy knows the specific gravity of sugar or how to obtain it, but it does matter whether he can appreciate Newton's Law of Universal Gravitation It does not matter in the least whether he remembers the properties of certain chemical substances but it does matter whether he understands what is meant by Conservation of Energy. Such concepts should find a foremost place among the major objectives of Science teaching. They cannot be adequately grasped with the aid of a few illustrative examples. They must be woven into the material presented to the pupil throughout his course. The following course will indicate, with regard to the Laws of Conservation of Mass and of Energy, how these concepts may be woven as threads of different colours into the fabric of the course.

Typical course

Part I The Sun, the Friend of Man

1. We are indebted to the sun for light, heat and food, and for most of the necessities and comforts of life.
2. The value of the sun's light Imagine the world without the light of the sun!
 (a) Sunlight gives grass its green colour (chlorophyll) and the flowers their many tints The spectrum colours and the rainbow Reference to Newton
 (b) Sunlight gives us health It aids growth and prevents and cures disease Food that has been charged with sunlight is rich in vitamins, which promote health and growth The value of open doors and windows in houses.
3. The value of the sun's heat Imagine the world without the heat of the sun!
 (a) The sun's heat promotes the growth of plants and animals. Vegetation luxuriant near the tropics and scanty in the arctic regions.

(b) The sun's heat produces wind How winds are formed. Wind and clouds Windmills Sailing ships and commerce Value of circulation of air in health

(c) The sun's heat produces clouds and rain How clouds are formed Steam, ice and snow Heat is taken in when water evaporates and is given out when steam condenses When water changes into steam (cloud), or into ice, the weight of water is equal to the weight of steam or ice. *Conservation of Matter*

4 The sun gives light and heat energy, both of which are necessary for plant and animal growth

(a) Plants and animals store the sun's energy.

(i) Small plants become trees and trees become wood, which we use as fuel Heat energy of sun reappears in the burning wood A plant is the product of the food it gets from the soil and the air and the energy it gets from the sun Conservation of Matter and Energy

(ii) Plants are used as food (grains, vegetables, fruit) to promote growth, warmth and energy.

(b) The sun's energy is stored in plants and trees and re-appears in coal, oil, petrol, kerosene, which are used to drive locomotives and motor cars and to give us light and heat

The principle of *Transformation of Energy* The earth has been conserving the sun's energy for millions of years Man is using this energy rapidly Economy is needed in using our energy resources

Part II The Sun and Man's Control over Nature

1 Man has controlled nature by inventing machines to utilize nature's energy

(a) Compare the world to-day with the world of only a hundred years ago with regard to transport, house comforts, etc.

(b) Recall the names of great inventors to whom we are indebted for the machinery of to-day . Watt, Stephenson, Davy, Faraday, Bell, Edison, Marconi

2. Machines are designed to transform and transfer energy. The energy stored in wood, coal, petrol is transformed into mechanical power, heat, light and electricity by *machines* In all energy transformations some energy is lost beyond recovery Engineers endeavour to reduce such losses to a minimum

Modern machines are combinations of a few comparatively simple types

(a) *Simple machines* the lever, the pulley, the wheel and axle (water wheel).

(b) *Winds* windmill, electric fan, steam turbine, sailing ships

(c) *Water* · the water wheel, turbine, Pelton water wheel, water lifter Water power in India (Tata Scheme), Switzerland, America, Norway and Sweden Reservoirs Power houses

The Study of Water.

Some properties of water , water is incompressible, finds its own level, exerts pressure Water pressure increases with increase of depth Water stored in a reservoir has *potential energy* , water in motion has *kinetic* energy. Potential energy depends on the weight of water and its elevation above some datum level

Potential energy may be converted into kinetic energy and vice versa

The Law of Conservation of Energy

(d) *Fuel*

(i) Steam Steam pressure, another source of mechanical power

The steam engine—boiler, cylinder, piston, slide valve, exhaust, crank shaft, balance wheel The use of each of these and the simple physical principles involved

(ii) Evaporation and condensation Boiling point Effect of pressure on evaporation and on the B P Latent heat and potential energy of steam Conservation of energy Heat losses due to radiation and conduction

(iii) Combustion. Oxygen necessary for combustion During combustion heat which was latent is evolved The products of combustion absorbed by soda-lime Increase in weight noted. Carbon dioxide.

(iv) Combustion in a closed vessel, weight remains constant Lavoisier's experiment Conservation of Matter

(e) *Electricity.*

(i) Electricity the most recent and most useful servant of man Electric locomotives, motors, lights, heaters, radio, telegraph, telephones.

(ii) Sources of electricity.

a. The voltaic cell Latent electrical energy.

b. The storage cell Energy stored by charging How to detect electricity (galvanometers, voltmeters, ammeters)

c. Electromagnetism Some properties of magnets Faraday's experiment Simple motor.

d Current, electromotive force, resistance Construction of simple voltmeters and ammeters

(iii) Uses of electricity as seen from its effects Motor power, heat, light, magnetism, electrolysis (plating). Simple experiments to illustrate these

PART III MATTER AND ENERGY TRANSFORMATIONS

1. The world is constantly changing In the physical world these changes are manifested as *transformations*, of *matter* from one state to another and of *energy* from one form to another Review of previous work.

2. Chemical Changes

(a) *The Conservation of Matter Types of Chemical Change.*

(i) *Decomposition.*

The preparation of oxygen

a Heat red oxide of mercury and potassium chlorate The properties and tests of oxygen. Priestley.

b Decomposition of water by electrolysis Burning of hydrogen to produce water. Illustrations of similar reactions The meaning of 'Reduction'.

(ii) *Combination*

The preparation of carbon dioxide The properties and tests of carbon dioxide Part played by carbon dioxide in plant and animal life Illustrations of similar reactions magnesium oxide, phosphorus pentoxide, ammonium chloride, etc The meaning of 'Oxidation'. Oxidation and Reduction

(iii) *Replacement.*

The preparation of hydrogen The interaction of sodium and water, iron and steam The properties and tests of hydrogen. The interaction of zinc and dilute sulphuric acid Examples of a similar kind

(iv) *Double Decomposition*

Some typical examples · e g potassium iodide and mercury chloride or silver nitrate and hydrochloric acid Acids, bases and salts

(v) *Solution* Conditions affecting solution Solubility Saturated solutions Crystals and crystallization.

(vi) The Law of Constant Proportions

The Law of Multiple Proportions Equivalents

Elements of the Atomic Theory Dalton.

Chemical Equations

In all chemical reactions we have the *Law of Conservation of Mass* · 'When any closed and isolated system undergoes physical or chemical change, the total mass remains constant.

(b) *The Conservation of Energy*

The Elements of Thermo-Chemistry

In some chemical reactions heat must be added , in others, heat is given out In the former case energy is absorbed, in the latter case energy is evolved. Examples of energy changes : combustion, explosives, welding (oxy-acetylene flame).

The distinction between endothermal and exothermal reactions Reversible reactions Energy changes in reversible actions. The storage cell or accumulator Charge and discharge. Chemical changes never occur without energy changes accompanying them In all chemical reactions we have the *Law of Conservation of Energy* 'When any closed or isolated system undergoes physical or chemical change the total energy remains constant' Chemical reactions result in the formation of new substances with either the absorption or evolution of heat

$a+b=c+d \pm H$

Radio-active substances Some substances called radio-active substances give out energy continually. Radium and Thorium.

3 *Physical changes.*

(a) *Change of state*

Elementary idea of the kinetic theory of matter.
Solids, liquids and gases
The effect of heat and pressure on physical states
Boiling and freezing The effect of dissolved substances on the boiling point and the freezing point of water Latent heat of vaporization and fusion. Distillation, fractional distillation The 'fractional' separation of substances
Freezing by evaporation Liquefaction of gases by cooling and pressure Liquid air The absolute zero of temperature

(b) *Energy and Power*

Energy and work Kinetic and potential energy
Changes from kinetic to potential energy and vice versa
Potential energy (mgh), kinetic energy ($\frac{1}{2}mv^2$) The pendulum, pile-driver, clock, explosives, storage cell
Natural sources of energy The sun, coal, petrol
The dissipation of energy Available energy.
Power as energy expended or work done per second.
Horse power. The Prony brake-test for horse power.
Electrical power. The kilowatt Wattmeters.

(c) *Energy transformations*

Various types recalled · mechanical energy, heat, light, sound, electrical energy, chemical energy

(i) The transformation of mechanical energy into heat Joule

(ii) The transformation of electrical energy into heat and light Radiators, arc light, filament light Review of terms current, electromotive force, resistance. Ammeters and voltmeters. Ohm's Law.

(iii) The transformation of electrical into chemical energy Electrolysis. The storage cell. Charge and discharge.

(iv) The transformation of mechanical energy into electricity and electricity into mechanical energy. The dynamo and the motor.
Electro-magnetic induction Faraday.
Simple A C and D C. generator. The magneto Transformers The transmission of power.

(v) The transformation of electrical energy into sound.
a. The telephone The transmitter and receiver. The telegraph.
b Radio communication Hertzian waves.

(vi) The transformation of chemical energy into mechanical energy.
The internal combustion engine (four stroke).
The cylinder and piston, the spark plug, the carburettor.

(vii) Radio-active transformations
The discovery of radium Becquerel and Mme Currie.
Radiation from radium X-rays The vacuum tube.
Elements of the Electron Theory

SOME SELECTED TOPICS

The lecture demonstration : lecture-table arrangements

The importance of a neat and orderly arrangement of apparatus on the lecture-table is seldom realized. A disorderly demonstration table leads to disorderly teaching on the part of the teacher, disorderly thinking on the part of the class and disorderly work in the laboratory. A boy once remarked to his teacher, who, for the first time, had set out his table in an orderly manner : 'Sir, doing things that way clears the brain.' A few practical hints may be of use to the beginner. Set out apparatus in the order in which it will be used, from left to right of the class. Lay down sheets of white paper or thin cardboard for apparatus which has to be shown up clearly ; turn the paper up at the back, when small objects have to be seen (e g. a compass needle). Remove all unnecessary apparatus, but leave bottles of chemicals to be used in the lesson, so that the general appearance of the contents may be seen. When erecting apparatus, retort stands, etc., look at the set-up from the point of view of the class, e g see that the retort-stand rods do not obstruct the view of the class. See that all apparatus is clean, neatly set-up and easily visible and try everything beforehand.

Make sure of what you want to do and do it confidently and leisurely Do not rush and do not get confused by accidents or by unsuccessful experiments. If such occur, go back to the beginning again and use the failure to a good purpose. Do not carry on a running commentary when experimenting, such as : 'Now I attach this wire to the positive terminal and you notice that so-and-so happens' This may do for the popular lecturer but not for the class-teacher. It is better to say : 'Watch what I do and tell me what happens.' Train the class to observe. For example, when teaching a class how to fold filter paper, go through the actions *without a word* and ask the class to do the same after you.

Blackboard

Scarcely less important than the laboratory table is the blackboard. If possible, have a stretch of blackboard extending the whole length of the lecture table. As in the case of lecture demonstration let the blackboard summary go from the left-hand side of the board towards the right. Write legibly, preferably in print script, and arrange the work neatly, so that at the end of the lesson the board will present a clear summary of the whole lesson. Do not scribble or scrawl on the blackboard, if you do not wish your pupils to imitate you. Draw all diagrams carefully and use coloured chalk freely. If you do not feel sufficiently confident of your artistic ability to do this, cut out some common forms (beakers, flasks, etc.) from a sheet of thin three-ply wood and use them as stencils Good blackboard work, like good lecture-table demonstration, is a skill which shows up the artistic teacher.

Experimentation

An experiment has in it all the elements of an adventure. It may be possible to predict, with reasonable certainty, that it will have a particular result, but the outcome is never certain until the adventure is over. So many variables enter into the situation that at times the element of chance seems to be dominant. But this is not so, the skilful experimenter, like the wise explorer, leaves as little as possible

to chance He tests and tries his implements beforehand and eliminates, as far as he can, all possible disturbing factors. Thorough preparation, methodical procedure, and attention to details are the secret of good lecture demonstration. Much will depend, as we have already seen, on the orderly arrangement of the table. It is a good plan to label parts that are liable to become confused during the experiment. For example, when demonstrating Oersted's experiment, only a short length of wire is needed. This may be labelled + and − in the direction of the positive and negative terminals of the battery, so that, if the wires become twisted during the lesson, the direction of the current may be readily ascertained. Let experiments be few in number, simple and convincing. Too many experiments tend to bewilderment; too difficult ones lead to vagueness.

A word may be said about the reprehensible practice of 'cooking' results in the classroom, that is, of making an experiment succeed by falsifying the readings Some teachers defend this practice, but why? If Science is not intellectual honesty, it is nothing How can the teacher uphold the great men of Science as worthy moral ideals, if they themselves act contrary to the spirit of the men they profess to extol? How can the teacher expect honesty in the laboratory—or anywhere else—if he does not set the example There is nothing lost but everything gained by being honest and straightforward. Many instruments cannot be relied upon to a high degree of accuracy. Why pretend that they can and why miss the chance of discussing the limits of accuracy of instruments used in an experiment?

The laboratory lesson: instructions

It is a common mistake to regard the laboratory lesson as essentially easier to conduct than the class discussion To watch an experienced teacher at work would, perhaps, suggest such a thought. When the lesson proceeds without commotion and the pupils apply themselves to the problem before them with evident interest and understanding, one is apt to forget that behind such order there is method, and, behind such purposefulness on the part of the pupil, foresight and planning on the part of the teacher. Far from the laboratory lesson being easy, there is no part of the Science teacher's work that is so truly the product of knowledge and experience. Let us begin where the successful teacher always begins, with laboratory instructions, either oral or written. The teacher cannot be too definite in his instructions. Nothing is more conducive to disorder in the laboratory than a vague objective. How often we hear the question, 'Please, sir, did you say hydrochloric acid or sulphuric acid?' or 'When do we add the acid, after heating or before?' or 'Why are you not further on with your experiment?' and the answer, 'I don't know what we have to do.' Let the class know exactly what is expected of them, be as definite as possible and use no more words than are necessary to convey the required information. Reinforce essential or specific instructions with a blackboard summary, for example, if the instructions are to take 100 gm. of water and 20 gm. of salt, write these numbers on the blackboard. Do not talk at length about things that the pupils already know or that they can easily find out for themselves. They will be eager to get to work, so let them do so as quickly as possible. Do not try to guard them against error but warn them against injury to the apparatus or danger to themselves Written instructions should be brief and definite,

with the emphasis on the things to be done or observed, rather than on the results to be obtained. Be careful to give the directions in proper sequence, with all necessary preliminaries first. For example, in a Chemistry experiment involving a certain set-up of apparatus, see that the bending of tubes, boring of corks, etc., necessary for the experiment are dealt with before the actual experiment is described. It is sometimes advisable to have headings, such as: Introduction—Apparatus required—Arrangement of apparatus—Experiment. It is sometimes a good plan to write the directions on the left-hand side of a folder of thick paper or thin cardboard, the right-hand side being reserved for equations, formulae, observations on the experiment, etc. By so doing, the essential directions can be made brief and to the point. Directions regarding conduct in the laboratory should be equally definite. For example, 'Groups One and Two will use balance No 1, groups Three and Four, balance No. 2,' or, 'Go to your benches and set to work. When you have finished the first part of the experiment, put up your hand.' Do not allow unnecessary moving about and insist on reasonable quietness. The laboratory should be a hive of industry, not a playground

Laboratory

One of the purposes of Science teaching is to give a 'training in observation'. Observation is not a specific faculty to be developed but a mode of activity to be cultivated We observe things in which we are keenly interested The skilled motorist will often detect noises in an engine which others fail to notice. A botanist will pick out a new specimen from a bunch of flowers which to the untutored seem all alike. Given an interesting problem and definite directions, we may expect keen observation It is said that Lord Kelvin, one of the greatest of scientific observers, once said to a student, who had invited him to look into his microscope: 'How can I observe anything, unless you tell me what I am to observe?' As a general rule, we may say that we observe the dynamic better than the static, and the vivid better than the vague. The child is interested in things that move and in things that stand out in contrast to their surroundings. *Movement* and *contrast* are signposts that will generally lead the Science teacher in the right direction.

Accuracy

The history of modern Science is the history of exact measurement. So accustomed have we become to associating exactness, precision and accuracy with Science, that we are apt to forget that these are modern ideals of scientific method. It is less than a hundred and fifty years since Lavoisier, 'the Father of Modern Chemistry,' showed us the value of accuracy with a chemical balance. However important it may be to instil habits of accuracy in the school laboratory, it is just as important to recognize limits of accuracy in scientific experiment. It should be a recognized part of Science teaching to discuss such topics as the accuracy of measuring instruments, the 'personal equation' or errors in observation and unknown or unmeasurable variable factors. With the naked eye we cannot estimate lengths closer than one-fifth of a millimetre, with the most careful attention we cannot avoid errors in observation, and, in spite of all precautions, factors beyond our control, such as radiation of heat, leakages, etc., are sure to enter. What are we to do in such cases? In the first place, we have to decide upon the degree of accuracy that we require. We may then decide to use a vernier, micrometer

or a travelling microscope to aid the eye ; we shall probably decide to take the average of a large number of readings rather than a single observation; we shall find it advisable to protect our experiment against heat losses or leakages, or else to ' correct ' for these losses by the application of certain corrections. Even the youngest pupil should learn that the ' good enough ' attitude will not do, that a dozen readings are to be preferred to one, and that care and caution will reduce errors to a minimum. Then, again, the pupil should learn to use common sense in the calculation of results. What is the sense in working out a result to the fifth decimal place, if the readings can be relied upon only to the first. Practice should be given in measuring to a specified degree of accuracy, for example, to measure lengths to the *nearest millimetre* or to weigh to the *nearest centigramme.* And, again, considerable practice should be given in computing results to the degree of accuracy of the readings obtained.

The laboratory notebook

The subject of note-making raises several questions. Should notes be dictated by the teacher or composed by the pupil ? Should notes be entered up once for all in the notebook or entered in a ' rough work book ' first, and carefully written up later ? Should experiments be described on the right-hand side of the notebook and the results inserted on the left ? Should notes be short (mere headings) or long (complete descriptions) ? There is no *answer* to these questions. With regard to the first question, much depends on the age of the pupil. A different treatment must be accorded the child of eleven from that given the more mature boy of seventeen In the early stages considerable guidance will, of necessity, be given by the teacher, in the later stages the pupil may be left almost entirely to his own resources. But even in the early stages the teacher will encourage the pupils to co-operate with him in the formulation of the note, while in the later stages he will occasionally dictate a definition or statement, if it must be given a precise form. A word may be said regarding definitions To attempt to exact a definition that is beyond the capacity of the class would be futile An incomplete definition may be accepted, if it is true as far as it goes and will not need correction afterwards, but an inaccurate definition given by the class should not be admitted at any time. Statements of well-known laws should be given, as nearly as possible, in the language of the person who first enunciated them. With regard to our second question opinion is divided. When laboratory notebooks have to be presented to examiners for inspection, the teacher is apt to exaggerate the importance of a neatly written book. On the other hand, there is no doubt that the immediate entry of results into the notebook is a much-to-be-desired habit. Perhaps the best solution is a compromise between these. Insist that all readings taken during the lesson be entered *immediately* into the notebook but allow the pupil to write up descriptions and to draw sketches and graphs at home, if there is not sufficient time for this during the laboratory period No hard and fast rules can be made regarding the writing-up of experiments. Most teachers recommend that the description and explanation of the experiments be entered on the right-hand page of the notebook, and that measurements and calculations (with the result) be entered on the left-hand side, in tabular form whenever possible. Diagrams and graphs may be entered on either side according

to convenience. Measurements and calculations, because of their importance, should be displayed prominently and should not be relegated to a corner of the page. With regard to the length of the record, it is sufficient if it gives, in as few words as possible, the description and explanation of the experiment. As a general rule, let the note be long enough to be intelligible to an examiner or inspector. Aim at brevity, lucidity and simplicity. The style of writing is important. Some authorities deprecate the use of the pronoun in the first person, but there is no great objection to this. On the whole a modification of the personal method suits best; for example, 'Took a beaker, half-filled it with water, and added a few drops of dilute hydrochloric acid.' Never allow the past passive form: 'A beaker was taken, it was half-filled with water, etc.' Always insist on the following being noted: number of experiment, heading, date, special apparatus used, and, where possible, the degree of accuracy of the readings Insist that the proper designations of the quantities be given, e.g. grammes, feet, seconds—both for measurements and for results, and that the axes be named and the scale be marked on all graphical work. It need hardly be added that all work done by the pupil should be carefully corrected by the teacher. This does not mean that the teacher should take upon himself the burden of writing in the corrections. The best plan is to mark the mistakes according to some easily recognized abbreviations; for example, S (spelling), p (punctuation), λ (omission), R (re-write), [(begin new paragraph), ? (obscure). The attention of the whole class should be drawn to common mistakes in spelling, expression or the interpretation of results. The teacher should be warned not to expect too much from laboratory experiments. To insist on a higher degree of accuracy than the instruments warrant is to place a premium on good fortune and to encourage 'cooking'. If a physical constant has been obtained (say, the specific gravity of brass or the latent heat of steam) the average of the class results should be taken as the accepted value, rather than that given in a book of physical tables. For purposes of comparison, it is a good plan to enter the class average, and the maximum deviation from it, in a special notebook kept for that purpose.

CLASSROOM METHODS

It is obvious that a subject so varied in its appeal as Physical Science cannot be made to conform to a single plan of presentation. Variety in classroom methods not only helps to sustain the interest of the class but also helps to relieve the teacher of dull monotony. While there is no 'general method' in Science teaching, many parts of the subject will be found to lend themselves to the following general treatment, which illustrates the recognized steps of 'scientific method'.

1. General discussion of easily observable phenomena illustrating the principle to be discussed.
2. A statement of the problem to be dealt with.
3. A tentative hypothesis and a plan of action suggested.
4. An experiment to test the hypothesis.
5. The statement of a conclusion or law.
6. Historical survey of the subject.
7. Further applications to life.

The following methods are described as actually used in the classroom. These are not presented as models suitable for lesson demonstration. An opportunity has been taken, while illustrating methods, to discuss some problems that even experienced teachers find difficult to present.

Subject: The Laws of Hydrostatics

1. Demonstration lesson

It may be taken as a general psychological law that children are more interested in the dynamic than in the static, more interested in things that are moving than the same things at rest. So we approach the subject of hydrostatics, through hydrodynamics (water in motion).

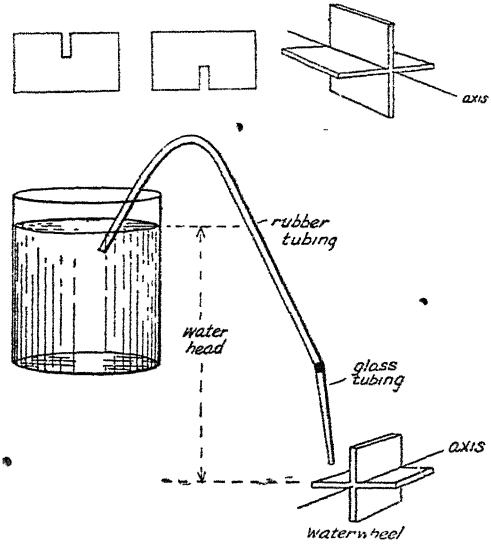


Fig 1

Introduction: If all the coal and petrol in the world were consumed how could we get our machinery to move? (Water-power.) Give names of places in India where water-power is used (Tata Scheme, etc.) What is the name of the machine used? (Turbine, water-wheel.)

Presentation 1 Make a small water-wheel (Fig. 1) from two light pieces of wood cut as in the diagram. Let a jet of water play on this from a siphon, the water in the reservoir being kept at a constant level. The vertical fall of water from the surface of the reservoir to the orifice is called the 'water head'.

2 Vary the water head and see how many turns the wheel makes in two minutes. (Put two columns on the blackboard headed 'Water head' and 'Turns per minute'.)

Note that the greater the 'head', the more revolutions per minute. So we elicit *'The pressure increases with increase of depth.'*

Now move the reservoir horizontally further across the table, and note that the same number of turns of the wheel per minute is obtained. So we get: *'The pressure is the same on the horizontal level.'*

3. We now substitute a pressure gauge (Fig. 2) for the water-wheel. Let us vary the 'head' and measure the corresponding reading of the pressure gauge. We find that the pressure again increases with

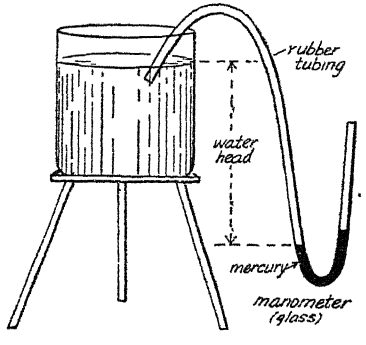


Fig 2

increase of depth and that the change in pressure is proportional to the change in water head.

4. We may use the pressure gauge of a slightly different type (Fig. 3) to measure the pressure inside a vessel of water.

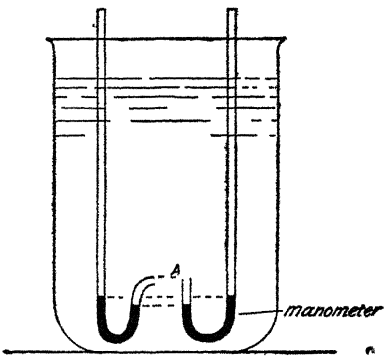


Fig 3

By altering the opening A so that it faces different directions, we may show that the pressure at any point of a fluid is the same in all directions

Conclusion : *' Water pressure increases uniformly with increase of depth.'*

' Water pressure is the same at the same horizontal level.'

' The pressure at a point of a fluid is the same in all directions.'

Note —The scientific definition of *pressure* as the *force per unit area* is not considered in this lesson.

Subject : The Sun as the Source of Energy

2. Discussion lesson

Introduction : We have decided to have a discussion to-day about machines and engines.

What do you understand by a machine ? Name some machines. (Locomotive, motor-car, sewing-machine, windmill, clock, etc.)

Let us now see what these machines do for us.

Presentation : 1 Take the motor-car. (It carries us, carries goods, etc.) Elicit the fact that the motor-car gives *motion ;* it does *work* for us.

Take other machines : sewing-machine, windmill, water-wheel, gramophone, clock, primus stove, electric light.

2. If these machines do work for us, we must feed them. We must put something in to get work out. What do we put into the motor-car ? (petrol); the locomotive ? (coal and water); the sewing-machine ? (muscular power); the electric light ? (electricity). Let us put these facts down in two columns ' What it gives us,' ' What is put in.'

3. Let us go over the list again and put down the places from which we obtain the things we put in. Where do we find petrol and coal ? (from the ground); water ? (from reservoirs and tanks); muscle ? (from food).

4. We shall now write down how they came to be there. Coal comes from trees, built of soil and water, aided by the *heat and light of the sun.* Water from rain, lifted up by the *sun* ; muscular energy from food, water, heat and light, all of which depend on the *sun.*

Discuss each suggestion in a similar manner.

Blackboard Summary :—

Machine	*What it gives us*	*What we put into it*	*Where and how obtained*
Locomotive	Motion	Coal	Ground, vegetation, *sun's heat and light*
		Water	Reservoirs, rain, clouds, *sun's heat*
Motor-car	Motion	Petrol	Ground, vegetation, *sun's heat and light*
Sewing-machine	Motion	Muscle	Food, vegetation, *sun's heat and light*
Lamp	Light	Kerosene and oil	Ground, vegetation, etc.
Stove	Heat	Wood, coal	Vegetation, etc.
Windmill	Motion	Wind	*Sun's heat*
Gramophone	Sound	Muscle	Vegetation, etc

5. Elicit the fact that all these machines have to do with *energy*, e g. muscular energy (the ability to do work).

Conclusion The sun is the chief source of the energy on the earth.

Subject : The Law of Equivalents

3. Project lesson

The 'project' has been defined as 'whole-hearted purposeful activity proceeding in a social environment'. We shall use the term 'project' to designate a problem carried through by the class as a whole, each member contributing something to the solution of the problem, either as an individual or as a member of a group.

Introduction : We have already learned that when hydrogen burns, water is formed, when magnesium burns, magnesium oxide is formed, when magnesium or zinc is acted upon by an acid, hydrogen is given off At the close of the eighteenth century, a German chemist, named Richter, discovered a law relating to the weights of certain elements, which would combine with definite weights of other elements. Let us see if we can find Richter's Law for ourselves. So many experiments will have to be done that we had better divide ourselves into groups. Each group will do a different experiment from the others and will report its result to the class next week. With the results of the groups before us, we shall discuss them together in class

Presentation : 1 We must have a plan of action. Will you suggest experiments for consideration ? We shall first discuss the given suggestions and then write the experiments to be done on the blackboard The class discuss possible experiments :—

(a) The action of acids (hydrochloric acid and sulphuric acid) on various metals (Mg, Zn, Fe, Sn, Ca, etc.).
(b) Displacement of metal from a solution of a salt of another metal.
(c) The combination of metals with oxygen by burning (Mg, Ca, Zn, Fe, etc.).
(d) The decomposition of water into oxygen and hydrogen by electrolysis.
(e) Combination of oxygen and metals by passing steam over heated iron or magnesium.

In each case the reaction is discussed and precautions to be taken during the experiment noted, e.g. all air to be displaced from apparatus in which hydrogen is being evolved because of the danger of explosion. The quantities of substances to be used are also considered. The students working with the action of acids on metals relate their equivalents to one gramme of hydrogen; those working with oxides relate theirs to one gramme of oxygen. Thus: x gm. Mg are equivalent to 1 gm. H; y gm. Mg. are equivalent to 1 gm. O; z gm. of O are equivalent to 1 gm. H. This part of the project will take, probably, a whole period.

2. The class now proceed to the laboratory to collect and set up their apparatus. The teacher supervises the work and makes suggestions, where necessary. The experiments are carried out during lesson periods or at other times according to convenience.

3. A full report of the experiment, with references and notes from books, is made and presented to the teacher, who discusses the report with the group.

Conclusion: The class meet in conference to compare results. For example: 16·5 gm of zinc when dissolved in dilute sulphuric acid liberated 600 c.c. of hydrogen, at 750 m.m. pressure and at 17° C. The density of hydrogen at S.T.P is 0·00009 gm. per c.c. The equivalent of zinc (the weight of zinc which displaces 1 gm. of hydrogen) is 32 8. The equivalents as obtained are then written on the blackboard in a column, and, in another column, for comparison, the equivalents recognized by chemists.

Some particulars of the life of Richter may now be given and the importance of the Law of Equivalent Proportions in the development of the Atomic Theory should be stressed.

SOME SUGGESTIONS REGARDING SUBJECT MATTER AND METHOD

Textbooks

A discussion of suitable textbooks would take us far afield. As a general rule, let textbooks be supplementary in character, supplying information that cannot be given in the classroom Have in the laboratory a special library containing standard textbooks both at the level and above the level of attainment of the class. Have also reference books on Science in Industry, Everyday Applications of Science, The History of Science, Biographies of Great Men of Science, Popular Science Books. See *A List of Books suitable for School Science Libraries*, compiled by the Science Masters' Association of England. (Apply to the publishers, *School Science Review*.)

Do not follow the order of a textbook rigidly. Remember that most textbooks are written according to a logical plan, which does not always suit the immediate needs of the pupil. Some parts may be too difficult for a first treatment of the subject It is better to leave these out and return to them later. Never be afraid to improve upon the textbook. The average textbook, written primarily for examinations, is far from perfect. It is generally a very poor guide on questions of method.

Picture lesson

An interesting change from the ordinary class lesson can be had by examining a picture or a set of pictures dealing with some scientific topic, for example, a manufacturing process. Some chemistry books give pictures depicting the manufacture of oxygen, liquid air, etc., with a diagrammatical representation of the

processes. The class may be asked to discover from an examination of the picture as much as they can of the processes involved.

End-of-term experiments

Most teachers experience some difficulty in keeping their classes actively interested at the end of term, when the examinations are over and holidays are in prospect. Some excellent suggestions for filling in these difficult days are given in a series of books issued by the S.P.C.K.: C. V. Boys, *Soap Bubbles*, J. Perry, *Spinning Tops*, Sir Wm. Bragg, *The World of Sound*, J. A. Fleming, *Waves and Ripples*, J. Fournier, *Wonders of Physical Science*. Other suggestions in the realm of Chemistry are given in Johnson, *Chemistry and Chemical Magic*, and in the *List of Books suitable for School Science Libraries*.

Little lectures

Caldwell Cook in *The Play Way* has given many suggestions that may be carried with advantage into the Science classroom. One of the most useful of the Playway methods is the 'lecture', prepared and delivered by a member of the class.[1] The teacher who has as his objective the development of personality and power in his pupils should not miss this opportunity for encouraging self-expression.

Another Play Way suggestion is that of the detective. Qualitative analysis, especially in its elementary stages, can be made into a game, to trace the 'wanted' substance. Acids can be differentiated from bases and salts by various indicators, which give 'clues' to the discovery of the unknown substance. Barium chloride can be used to 'detect' sulphates, and so to distinguish sulphuric acid from a number of other acids, all of which pass the litmus test.

Variety

In our discussion of classroom methods we have emphasized the importance of variety. It has to be remembered that some boys are more interested in the history of Science than in experiments, some are more interested in general theories than in practical applications, some more interested in the mathematical treatment of the subject than in instruments, and the converses of these statements are, of course, also true. A judicious combination of the many aspects of Science is to be preferred to any one of them. The teacher should guard against personal bias in any one direction

The use of formulae and equations

It cannot be too strongly emphasized that much harm is done to a rational understanding of chemistry, if formulae and equations are introduced too early. The teacher who allows beginners to refer to sulphuric acid as H_2SO_4, common salt as NaCl, or water as H_2O is clouding the minds of his pupils by making the subject unreal. Again, pupils are sometimes taught to write $NaOH + HCl = NaCl + H_2O$ without having any idea of the real significance of the chemical change involved. Chemistry is not another branch of Mathematics. Similar remarks apply to the introduction of the Atomic Theory, which is generally introduced far too early. The Atomic Theory should come *after* the Laws of Definite Proportions, Multiple Proportions and Equivalent Proportions have been dealt with, not before. In these matters the historical development is a fairly safe guide.

It is never safe to assume that, because a set lesson has been given on the foot, the metre, the gramme or the second, these units of physical measurement

[1] See also pp 5, 72

are realities to the class. Every opportunity should be taken to train pupils to estimate lengths, areas, volumes, masses and times.

Physical units Reference should frequently be made to the terms 'unit' and 'measure', the former being any standard of the same kind as the thing to be measured and the latter the number of times the unit can be divided into the quantity measured Expressed algebraically $\frac{Q}{U} = M$.

Care must be taken with regard to the designations of the units employed. The unit of length is 'one foot' (1 ft.) or 'one centimetre' (1 cm) or 'one metre' (1 m.) according to our choice. Thus, measuring 'one yard' in terms of 'one foot', we have $\frac{1 \text{ yd.}}{1 \text{ ft.}} = 3$, or 1 yd. = 3. ft., which means '1 yard is equal to 3 times 1 foot'. Therefore, to put down the length of a beam as 4 is meaningless, unless the unit is stated. Similarly, 1 metre = 39·37. in. and 1 lb. = 453·6. gm. (Note.—The singular form 1 ft. = 12. in. is to be preferred to the plural 1 ft. = 12 inches.)

The difference between density and specific gravity (relative density) needs to be carefully explained.

$$\text{Density} = \frac{\text{mass of body}}{\text{volume of same body.}}$$

$$\text{Specific gravity} = \frac{\text{mass of body}}{\text{mass of an equal bulk of water.}}$$

Thus specific gravity or relative density is a *measure*, and is therefore a pure number. Similarly, specific heat is also a number. We may refer to the specific gravity or relative density of mercury as 13·6, but the density of mercury is 13·6 *gm per cub cm.* Again, the density of mercury $= \frac{13{\cdot}6 \text{ gm}}{1 \text{ c c.}} =$

$\frac{13{\cdot}6 \times 0{\cdot}035 \text{ oz.}}{0{\cdot}061 \text{ c.in.}} = \frac{7{\cdot}81 \text{ oz.}}{1 \text{ c.in.}} = 7{\cdot}81$ oz per c.in

Thus, different numbers represent the density of mercury according to the units employed, but only one number is required for its specific gravity.

We have already urged that the child should be placed, as far as possible, in the position of an original discoverer This does not mean,

Discovery of course, that he should be expected to rediscover all the elementary facts and theories of Science for himself, but it does mean that he should experience in his Science lessons some of the zest of the investigator and some of the joy and satisfaction of the discoverer. To give as laboratory instructions the following: 'Pour sulphuric acid on zinc dust and note that hydrogen is given off' or 'Show that copper sulphate contains two-fifths of its own weight of copper', or 'Show that the specific gravity of glass is 2·6', or 'Verify Hooke's Law', is to deprive these experiments of much of their attractiveness. Leave the pupil to some extent in the dark, so that, when light comes, he may have the pleasure of surprise. Do not, on the other hand, withhold information that is not an essential element of the thing to be discovered.

There is no better indicator of the quality of work done in the Science classroom than the condition of the laboratory and its fittings. When one finds apparatus in good repair, balances in order, beakers and flasks clean,

reagent bottles well stocked and the whole laboratory neat and tidy, one can be fairly certain that the Science master has his heart in his work. In laboratory management, as in the conduct of a business, it pays to be methodical. It is important that all apparatus should be overhauled and cleaned periodically, so that repairs may be effected before the apparatus becomes useless. The teacher should place upon the student the responsibility of returning all apparatus clean and in good order and of reporting all breakages. Some excellent advice on laboratory management is given by A. Sutcliffe in *School Laboratory Management*, which the teacher of Science is strongly advised to read. A discussion on the planning of school laboratories would be out of place here but the teacher will receive much inspiration and many useful ideas by reading a standard book on the subject. A pamphlet issued by the Superintendent of Documents, Bureau of Education, Washington, U.S.A. entitled *Laboratory Layouts for the High School Sciences* (Bulletin No. 22), by A. C. Monahan (price, 15 cents), gives an excellent summary of the subject.

The laboratory and its fittings

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Chapter II

THE TEACHING OF NATURE-STUDY

For some years past educators have recognized the strong claims of Nature-study to a place in the school curriculum; and its introduction goes a long way towards satisfying those critics who allege that there is a strong line of demarcation between the life of the child in school and his life outside school. It should give him an intelligent interest in natural objects and phenomena, and may be defined as 'learning to be really alive to the world around'. The use of the word 'study' implies that independent work must be done by the pupil; and whilst books, pictures, and models are valuable aids in our teaching, the subject matter is Nature herself. Experience has shown that teachers often treat the subject as if it were nature *knowledge* and not nature *study*, and their lessons savour too much of knowledge and too little of nature. What is essential for success, in the first instance, is enthusiasm on the part of the teacher, rather than expert knowledge. He must be a student of nature and use his senses on the material around him. The natural way is the child's way: i.e. by coming directly into contact with nature.

Aims and methods: educational aims

1. The cultivation of interest in the world around. Young children enjoy the beauties of nature when they have become sufficiently cognizant of them to appreciate what they see and hear.

2. The development in the mind of the growing child of habits of careful observation; later, of coherent reasoning. Careful and accurate reasoning can never result from careless and inaccurate observation; but as the young child is incapable of discriminate observation, it is the duty of the teacher to direct him—but not to do the work for him.

3. The cultivation of the power of expression. At all stages children should give expression to the results of their observation Oral and written descriptions, sketches and models made by the children are all means of expression, and through Nature-study there should be increased facility of expression either by language or some form of handwork, or both.

4. The free development of the individuality of the child. It is *he himself* who must observe, must draw conclusions from facts, must verify these facts from further observation, and must record the results of his work, thus he will gradually gain the habit of relying on himself and his own work

The subject matter

In selecting subject matter the aim should be to make the schemes of work suit local conditions, and to choose for lesson-material not what is easiest for children to learn, but what will help them best to grasp the elements of some of the problems of nature. It is not necessary that the study should go far into details; but study which leaves only hazy impressions or a heterogeneous accumulation of facts should have no place in the school. If we keep ever before our minds two important points we shall be helped in framing our schemes:—

1. That the value of the inclusion of Nature-study in a school curriculum lies more in the importance of the subject as a means of educating the child-mind than as a means of imparting information.

2. That the subject brings the mind into contact with every side of nature as made evident to us in our environment.

Consequently we have a very wide field. Thus, for example, rocks, soils, and meteorological phenomena come within our circle of studies, not only for themselves, but because of their influence upon living animals and plants.

Teachers who have studied plant life may be tempted to make their courses almost exclusively botanical, because of the ease with which plants can generally be obtained. The first-hand study of rocks and soils may involve covering a considerable stretch of ground, while the difficulties of keeping animals alive in aquaria or vivaria deter many teachers from the study of living animals. This is to be regretted, as young children have a ready-made interest in animal life, since animals *do* things, and children understand that animals are alive, show fear, pleasure, anger, etc. This rouses their sympathy, and for that reason the study of animal life has a great moral value. The keeping of vivaria and aquaria, in which the development of insect larvae, frog spawn, the movements of fishes, etc, may be watched, ought to form part of the work of every course

A preliminary course of observation lessons

In the junior classes of secondary schools the teaching of Nature-study should be preceded by observation lessons on the natural objects or phenomena with which the pupil is most familiar, and on specimens which he himself has collected. In every case the object should be present when the lesson is being given.

As these lessons are preliminary to the more advanced teaching of Nature-study where scientific method is more evident, they should be given in such an order that the one subject leads on naturally to the next. For example, the collocation of elephant, butterfly, and shark for observation lessons is obviously absurd, though a series of lessons on a fish, followed by a series on a frog, or lessons on fruits and seeds, followed by one on the migration of seeds, would be a logical sequence.

Again, wherever possible, the work should be seasonal. Thus, a lesson on rain should be given during the monsoon, a lesson on harvest operations in a harvest field, and one on the classification of plants when flowers are most abundant.

The subjects available for observation lessons are innumerable, and the following list must only be regarded as suggestive :—

Outline courses of observation lessons

Change in the length of a shadow; the directions, N., S., E., W., periods and directions of winds; clouds and rain; the 'bursting' of the monsoon, measurement of rainfall; soils, e g sand, clay, humus, their different capacities for holding water, seasons for sowing and harvesting paddy, and specimens of the rice plant at various stages, description of a paddy field and its drainage; comparison of the rice plant with other grasses, e g bamboo, sugar-cane, wheat, lemon-grass, etc.; some common Indian trees, common shrubs, e.g croton, tapioca plant, castor-oil plant, etc; common herbs,

e.g. grasses; climbing plants, why plants climb, how they climb; a few parasitic plants; water plants, and their adaptation to environment.

Collections of leaves, flowers, fruits, and seeds of the above-named plants and drawings of the same should be made, and the time of year when each is most abundant noted. At intervals during the school year exhibitions of plants collected, if systematically arranged, have a distinct educational value. A useful classification of plants is as follows :—

1. Plants of the roadside and the field.
2. Plants of the sandy sea-coast.
3. Plants of the salt-water marsh.
4. Plants of the fresh-water marsh.
5. Plants of the tank, or pond.
6. Plants of the hills.
7. Plants of the open forest.
8. Plants of the denser forest.

As the pupil advances the lessons will make more demands on his powers of reflection and reasoning, and about the beginning of the lower middle section of the secondary school Nature-study proper will commence.

Nature-study in the junior classes

Much of the truest nature teaching is that which does not take the form of set lessons, e g germination of seeds, collecting and mounting of leaves and wild flowers, watching the development of plants and animals, learning the song and call notes of the commoner birds of the district, observing the movements of fishes in an aquarium, etc. The keeping of a Nature Calendar in which the following details are noted is an excellent method of stimulating independent observation :—

NATURE CALENDAR FOR EACH MONTH

Date when found	*State of the weather*	*Wild plants*[1]	*Garden plants*[1]	*Birds*	*Insects*[2]	*Other animals*	*Remarks*[3]

Lessons on animal life should include the life-histories of an earthworm, of centipedes, of butterflies and moths with the aid of specimens reared from the caterpillar stage, and with dated drawings of the stages passed through; the structure of a common large insect, e g. the cockroach, the structure and social habits of bees and ants; the scorpion, the spider (not insects), snails and slugs, the food, beaks, wings, plumage, and habits of different birds of the locality; the external forms and habits of certain reptiles, e g. lizard, chameleon, tortoise; also descriptions of a well-known snake and of a crocodile; the life-histories of a frog and of various types of water creatures, e g. fishes, insects, and their larvae; animals of the sea

[1] Note the condition of the plant, whether seedling, in bud, in flower, or in seed
[2] Note what insects visit flowers, and the flowers they visit
[3] Note approximate altitude and general slope of surface where found, especially if to north or to south.

shore, e.g. shell-fish, crabs, sea-urchins, sponges ; the teeth of animals ; the limbs of domesticated animals.

In sea-board towns, as elsewhere, the scheme should be suited to the environment. Opportunity is here afforded for lessons on sand, the waves, the work of the sea, etc., and observations should be made as to where rocks serve as temporary or as permanent homes for marine animals.

A dated record of the structures studied, and of the natural phenomena discussed in class, should be preserved by each pupil, and, as far as possible, labelled sketches should accompany such observations. At first the pupil will need help in distinguishing outstanding features, and the teacher's aid will be necessary in summarizing what ought to be remembered ; but at no time should notes be dictated

Drawing from nature, with pencil and coloured crayon or brush, such natural forms as bud, leaf, flower, fruit, shell, insect, etc., must have a definite place in the Nature-study courses. For example, sketches might be made at regular intervals to show the rate of growth of the coco-nut up to the time of seed germination, and parallel with these another series of sketches of dissected coco-nuts of corresponding sizes Again, a certain twig might be drawn once a month all the year round, the drawings illustrating its history from the opening of the bud to the dispersal of the seed. The life-history of a butterfly from the caterpillar stage onwards also forms an interesting and connected series

Nature-study in the senior classes

This course of Nature-study, which may be regarded as the first stage of the teaching, should merge into more scientific instruction when the pupil has reached the fourth form (counting from the top) of a secondary school Experimental work should now be done as far as possible by the pupils themselves, who should be led to generalize and to test their generalizations by further experiment. At this stage records of work should be kept without the aid of the teacher, though he should bring them under review at regular intervals. In addition to the laboratory work, of which an outline is given below, occasional excursions should be made to study the physical geography of the district and to observe how the sun, rain, wind, rivers, frost, and snow act on solid rocks, changing their shape and form, with a view to understanding (1) development of scenery, (2) weathering of rocks and the making of soil, the latter involving a study of the relations of rock structure and composition to plant life. Other subjects for study on excursions are · local plant, insect, pond, and shore life, the influence of climate, elevation, water-supply, etc, on plant life ; methods of nature for securing cross-fertilization and seed dispersal ; the inter-relation of plants and insects, the classification of plants and insects. The object of an excursion is not merely to make a collection of plants and animals, but to study individual species and their adaptation to particular conditions of life, not as isolated things, but as 'threads in the web of life', dependent on one another and on their inanimate environment. It is well that each excursion should be projected for some special purpose It will not be found possible or desirable to keep strictly along the line thus laid down ; but the arrangement of a definite plan will avoid much diffusion of time and energy.

The more intelligent pupils who have an aptitude for Nature-study may

be encouraged to make a survey of any district in which they are particularly interested. The work need not be burdensome, and might extend over one or more school years, the record to include a plan of the district drawn to scale with an account of the plants, birds, insects, rocks, etc., found within it. At fortnightly intervals notes might be entered in the record-book regarding the condition of vegetation and the plants and animals observed, illustrations and specimens of the more conspicuous plants in flower at different times being inserted on alternate pages. It might also include photographs of interesting places in the locality, and of natural objects, e.g. birds' nests, eggs of different animals, etc. The district selected should illustrate at least two types of vegetation, preferably hill and valley, banks of a river and sea-shore, etc. A separate book of views, with coloured drawings of plants and descriptive notes telling where and when found, might be added.

Visits should also be paid to the natural history sections of museums, when conveniently situated.

Besides the school laboratory, an essential adjunct in the higher forms (and desirable also in the lower) is the school garden, which is to be regarded as an out-of-door Nature-study laboratory. Where gardens have been established they have proved a fruitful means of developing the powers of observation and reasoning, while affording opportunities for experimental work on a much larger scale than is possible indoors. A few details regarding them are given on pages 208-9.

Pupils should be encouraged to set up apparatus, and (when possible) to construct it. It is quite unnecessary to use elaborate or expensive instruments, many satisfactory results being obtainable with home-made apparatus.

Outline course of laboratory work for senior pupils

1. Fitting up of apparatus and its use, cork boring and fitting; glass tube bending; making of a simple vivarium and aquarium; use of balance; use of microscope for the study of cells and of some common lower plants and animals.

2. The atmosphere: composition and properties; 'rusting', burning, breathing.

Temperature of the air; causes of variations in temperature, the thermometer and thermograph.

Pressure of the air: the barometer and barograph, variations in pressure, winds.

Moisture of the air; the hygrometer, dew, mist, cloud, rain; rain-gauge.

Weather charts: making and recording observations.

Daily records to be made by each pupil as follows:—

Date	*Barometric pressure at 10 a m and at 3 p m*	*Temperature at 10 a m and at 3 p m*	*Wind direction*	*Rainfall in inches*	*Weather*

The variations may be represented graphically on squared paper at the end of each month.

3. Preparation and properties of oxygen, hydrogen, and carbon dioxide; water, its composition and properties, water as a solvent and food carrier, purification of water and of mercury.

4. Freezing, boiling, latent heat; solution, osmosis, capillarity.

5. Rocks: weathering, soil, identification of common rocks and minerals in hand-specimens, collections of sand and rocks from different places to show the origin of the sand.

6 Soil examination :—

(a) Dry soils	Mechanical analysis by sieve; specific gravity by bottle; soluble matter.
(b) Soils and water	Rate of rise of capillary moisture in soils, Moisture capacity of soils; Percolation of water through soils
(c) Soils and air	Rate at which air passes through soils.
(d) Soils and organisms	The presence of the latter shown by the evolution of carbon dioxide; nitrogen-fixing bacteria of leguminous plants.

7. Simple experiments on plant physiology can be selected from a few elementary textbooks on botany.

8. Studies with the aid of the microscope, e g. the various tissues of root and shoot, and their arrangement; open and closed bundles; the living vegetable cell, its structure and contents; germination of pollen grains in sugar solutions; the spores of ferns; the lower forms of plant and animal life, e g. yeast, moulds, amoeba, the sperms and ova of the sea-urchin.

9. Animal life: development of moth, butterfly, centipede and millipede, frog, fish, and other specimens suitable for vivarium and aquarium; structure of frog and fish.

As before hinted, no scheme should be adopted by the teacher without his having regard to his own possibilities. Further, while the above suggested studies are intended to indicate what may be attempted under suitable circumstances, the teacher should consider carefully the order in which the different topics will be treated. As the sections relating to physics and chemistry are introduced chiefly as a basis for a clear understanding of the workings of nature, it may often be found advantageous to take them when it is thought they will best arouse interest and be of greatest application.

The laboratory and its equipment

The plan of a Nature-study laboratory need not differ much from that of a school chemical laboratory It is important that it should have plenty of light, preferably northern light, and as much ventilation as possible. Adjoining the laboratory a small dark room is necessary for experiments on plants, e.g. for the purpose of comparing the effect on them of light and darkness. The cost of equipment and of maintenance need not be large, and in schools where practical Physics and Chemistry are being taught, much of the same apparatus may be used for experimental work in Nature-study, e g. glass tubing, flasks, funnels, thermometers and barometers, distilling apparatus, weights,

balances, etc. Three or four compound microscopes (each costing about seventy-five rupees) will be necessary. As regards other items, details depend on the teacher's syllabus, but the total cost should not exceed one hundred rupees per annum.

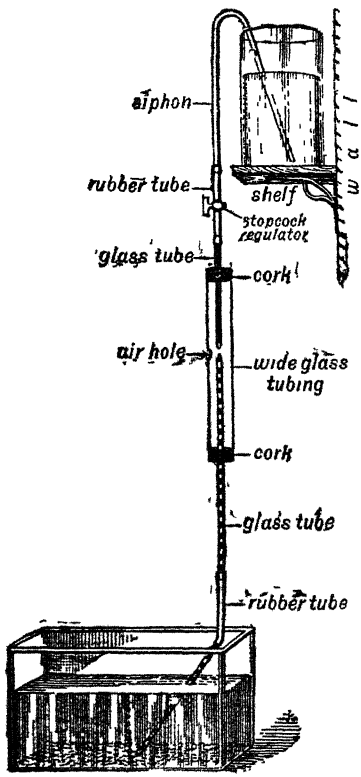


Fig 1.

An accumulator cell may be used as an aquarium, or a cheap and simple form may be made out of a carboy (often used for holding sulphuric acid) by getting a glass-cutter to remove the upper half. Separate aquaria are required for marine and fresh water animals, and care must be taken not to mix those that are known to be inimical to each other. The surroundings of the animals should be as natural as possible, and for that reason sand, pebbles, and the usual weeds should be placed in the water. Small aquatic snails should be kept in all aquaria in order to free the glass from algal growths. The healthiest aquaria are those in which water is constantly entering and flowing out at a slow rate, and where the water is thoroughly aerated by some suitable apparatus such as that shown in the diagram.

A vivarium for the study of insects is easily made from a cigar box in which the wooden lid has been replaced by glass. Several vivaria will be necessary for the simultaneous study of different insects.

The aquaria and vivaria should be placed underneath windows.

The school garden

School gardens are intended in the first instance to serve as object lessons in Nature-study, though at a later stage they may develop into open-air agricultural laboratories for the investigation of problems connected with soil and plant life In addition to their purely educational value, they may, with the assistance of agricultural officers, be made to serve another purpose, viz to demonstrate to farmers the scientific principles of agriculture

The site for the garden should be selected after consultation with an agricultural expert, who will also be able to give advice regarding the plants that are suitable for cultivation in the district. Fertile soils should be chosen as near as possible to the school and also to a water supply.

In a school of three or four hundred pupils the garden, to start with, need not exceed a quarter of an acre in extent—though of course the size depends on the available ground—and this may be divided into fifteen or twenty plots of uniform area, separated from each other by paths. On each plot a single type of vegetation should be cultivated, e.g. peas, beans, brinjal,

chillies, cucumber, vegetable marrow, maize, okra, pineapple, yams, etc. Ornamental flowers may be grown in a few plots, but it is not always advisable to plant trees, as they may interfere with the growth of the plants at a later stage

A complete history of the plants grown on each plot should be kept by the teacher, and every pupil should record in a diary his own observations, along with an account of the operations in which he has taken part. Besides observations on the plants themselves, notes should be made on the birds and insects which visit the garden, also on fugal and insect diseases which may attack the plants.

Simple experiments may be performed, partly by the teacher with the class, and partly by the pupils themselves. Thus, under 'assimilation' the teacher can perform an experiment to illustrate starch formation in green leaves. To understand the 'healing of wounds' in plants, each pupil may cut off half a leaf, a branch at its base, and a branch about the middle, from the plants in the school garden, and note at intervals throughout the year the conditions of each. Other experiments will suggest themselves It may only be added that the success of a school garden depends mainly on the ability of the teacher to arouse and maintain interest in it.

The use of museums

In Nature-study, museums are the best textbooks; but they require to be well arranged, and effectively studied by children. Public museums provide liberally for the serious student and for the expert, but something remains to be attempted on behalf of children. The aim is not so much to communicate information as to excite interest, awaken the curiosity, and attract the attention of children by the exhibition of interesting and beautiful objects. Where the officials in charge are willing to co-operate with teachers in drawing up lists of suitable subjects, and in giving lessons associated with the specimens in the collections, the educational value of such institutions is greatly enhanced.

By the use of a lantern picture, or of an enlarged model, it is possible to overcome some of the difficulties experienced by large classes when closely examining specimens in cases. But such explanatory illustrations should be followed by visits to the actual objects in the collections, with a recapitulation there of the instruction regarding them. The following subjects are suggested as suitable for museum demonstrations —

1. Hoofed animals, e.g. elephant, ox, horse, goat, sheep, etc. Odd- and even-toed animals.
2. Animals which 'chew the cud'. Oxen and deer The horn of the ox and the antler of the deer.
3. Flesh-eating animals, e.g dog, cat, lion, tiger, panther, etc. The claws of dogs contrasted with those of cats.
4. Rodents or gnawing animals, e.g. rats, mice, squirrels, etc. The adaptation of their mouth parts.
5. How animals defend themselves. Teeth, tusks, horns, poison-fangs, stings, etc.
6. Some common local poisonous snakes, e.g krait, cobra, hamadryad, Russell's viper, etc.
7. Butterflies and moths. The egg, caterpillar, chrysalis and adult, scaly wings.

8. Life in a tank. Frogs, newts, water-beetles, dragon-flies, etc.
9. Life on the sea-shore. Crabs, shell-fish, sea-anemones, etc.
10. Meteorological instruments. Barograph, rain gauge, anemometer, hygrometer, etc. The weather chart.

The above list indicates a few of the many topics which may be studied more profitably in public museums than in schools, according to the method here suggested. But it is only in the larger towns, where there are museums, that a scheme of this description can be developed.

In every secondary school where Nature-study is a subject of the curriculum, a room should be set apart for the exhibition and study of specimens collected by the pupils themselves and arranged with special reference to the geology, zoology, and botany of the locality in which the school is situated.

The following is a list of Nature-study exhibits suitable for the school museum :—

1. The butterflies and moths of the district.
2. Sands from different places, and the rocks from which they have been formed.
3. Pebbles, minerals, ores, rock specimens, and fossils for geological studies.
4. Shells to illustrate different structures and shapes
5. Slices of different kinds of trees to show rays, rings, grain, etc.
6. Seeds and fruits: (a) methods of seed dispersal; (b) types of simple, aggregate, and multiple fruits.
7. Specimens of leaves, preserved and mounted to show differences in shape, venation, margin, method of attachment.

It is desirable to place alongside of the exhibits descriptive diagrams, illustrations from books, photographic enlargements and models, provided they show more clearly the details to be observed in the actual specimens.

The walls of the classrooms may be suitably decorated with specimens of leaves and flowers mounted and systematically arranged. Groups of pupils should be held responsible for collecting certain types of leaves, etc., their collection being examined at least once a month by the teacher, and the finest specimens exhibited on the walls.

ILLUSTRATIVE EXAMPLES OF LESSONS

Show the pupils examples of (1) *torpedo-shaped*, (2) *flat* fishes in aquaria.

1. The appearance and movement of fishes

Ask them to observe and make outline sketches of the forms when seen (1) from the side, (2) from above.

Can the fish turn its head without turning its body—that is, has it a neck? Why?

Is the tail distinctly marked off from the body?

Does the fish bend its whole body, or only part of it, in swimming?

Different forms of fish are suited to different modes of life. Which form is best adapted for swimming?

Where is the flat fish generally found?

Note differences in colour between the upper and lower surfaces of the flat fish. What are the reasons for these differences?

Observe the fins and the position and use of each Which fins (1) propel, (2) guide, (3) balance the fish ?

On what parts of the body are the fins situated ? How many pairs are there ?

To what do these paired fins correspond in the human body ? Describe the body covering of the fish.

Has the fish any teeth ? How many gills has each type ? What is the use of the gills ? How can new supplies of air reach them ?

Observe how the fish uses each fin under the following conditions :—

1. When at rest ;
2. When moving slowly forward ;
3. When moving rapidly forward ;
4 When backing ;
5 When stopping ;
6. When turning ;
7. When moving upwards or downwards.

How are fishes distinguished from other animals ?

Elicit the following :—

1. Mammals, reptiles, birds, amphibians, and fishes are vertebrates, or backboned animals, but the fish differs from the rest in *possessing gills throughout life*
2. The skin of the fish is provided with scales
3 The pectoral and pelvic fins represent the two pairs of limbs of other vertebrates, but the fin is not *jointed and does not end in digits.*

2 Caterpillars and their transformations

If an animal were discovered which existed first as a serpent, then developed into a mummy-like body and finally into a bird, how astounding would be the news of its discovery ! Yet the supposition is no more strange than the actual transformation of a caterpillar into a butterfly or moth.

A caterpillar is sometimes called a *larva*, the Latin word for a mask, the idea being that it is in a masked condition before it emerges in the form of an insect. Between the larval state and the *imago* or perfect insect there is a 'resting stage', during which the insect is changing from a crawling to a flying animal. In this state it is called a *pupa* (Latin for baby). The pupae of certain butterflies have golden spots, hence the name *chrysalis*, which is derived from the Greek world for gold, and is synonymous with pupa.

These stages should be illustrated by living specimens reared by the teacher and his pupils. In India there is no difficulty in finding them, and their development can be easily watched. Let pupils collect specimens, lifting them very carefully on the leaves upon which they are feeding, and placing each in a separate wooden box with a small quantity of earth at the bottom Mosquito netting should be fitted on the top of each box to prevent their escape, and at the same time to allow free passage of air. If the box be constructed so as to have one side of glass, facility for observation and sketching is offered.

Pupils should sketch the caterpillar as it feeds on the leaf, noting its head and strong jaws, also its soft body divided into very distinct segments How many legs has it, and where are they placed ? How do the legs on the

first three segments differ in appearance from the other appendages? Describe the mode of walking or crawling in different specimens

All caterpillars have large appetites, and it is necessary to supply them daily with fresh leaves from the species of plant on which each was feeding at the time of capture. Interesting experiments may be performed to ascertain the weight of food consumed per day by a caterpillar. If other animals were to eat as voraciously, the world's food supply would soon be exhausted Do they all eat at the same hours? Does each feed exclusively on one kind of plant? Devise an experiment to answer the last question.

Owing to the amount they eat they grow very rapidly, and are obliged to split their skins This they do repeatedly, crawling out of their old coats clothed in a new skin, until at last they cease to eat, and pass into the 'resting stage' as a pupa. Dates of moulting should be noted with the sketches, and a brief description of the animal after each moult added Coloured drawings of the pupa should also be made, and the manner in which it passes the time observed and described. During this period, which usually lasts only a few days, it is undergoing internal changes. When these are completed, the chrysalid skin is ruptured, and the full-grown insect is set free. Arrayed in all its splendour, it flutters from flower to flower, sipping honey as it goes, and caring for nothing but its own pleasure. After mating, the female lays her eggs, and the life-work of the insect is finished.

The silk-worm[1] is a good example for study in Indian schools. It is one of those caterpillars which, in the chrysalis state, construct for themselves silken houses or cocoons A cocoon is shaped like a pigeon's egg, and within it the chrysalis prepares for its sleep and for its transformation into a moth.

3. The life history of the mosquito[2]

There are in India many kinds of mosquitoes which exhibit a considerable amount of resemblance one to another, though they differ in points of minor importance, such as colour, size, etc. They agree in passing through three stages during their lives, as larvae, pupae, and perfect insects; and at each stage the different species have certain resemblances.

The type selected for study is a common mosquito whose larva inhabits stagnant pools Place a few larvae in a vessel of water—a crystallizing basin is convenient—and cover it with mosquito netting Using a good lens and placing the vessel in sunlight, notice the form of the body, its length, the tufts of bristles that stand out from it, and the parts into which it is divided. Has it limbs or fins? Describe its movements in swimming Observe that it floats head downwards, hanging by its 'tail' from the surface. Pour a small quantity of kerosine into the water. Does the larva continue to float? If it does not, can you state the reason? It may be mentioned that the larva breathes by means of a tube near the 'tail' which protrudes a short distance above the surface

[1] See *Directions for the Cultivation of Eri Silk*, Bulletin No 29 of the Agricultural Research Institute, Pusa, published by the Superintendent of Government Printing, Calcutta, price 3 annas.

[2] See S A Harris, *A Short Course of Object-Lessons on Mosquitoes*, Government Press, United Provinces, Allahabad, also B S Chalam, *Story of the Mosquito*, Oxford Univ Press, price 4 annas

Try the following experiment. Float a needle on the surface of water. This can be done easily, though the needle is heavier than water. When kerosine is poured on the water the needle sinks. Why?

Obtain a few more 'wrigglers', as the larvae are sometimes called, and place them in water in another crystallizing basin. Observe and describe the bright band round the head of each, and the movements, if any, in that part of its body. What do you think is their meaning?

Like the larvae of other insects they increase in size, and are obliged to cast their skins. Their food consists of very small plants and animals which are always present in stagnant water, though not visible except under a microscope of high power. After some time the larva changes into a pupa, shaped like a comma (,), which is as active as the larva, but floats head uppermost. Beneath the pupal sheath the insect develops fully, and when it is ready to emerge, the sheath gapes open, serving as a boat from which the winged insect takes its first flight.

The male insect is quite harmless, living on the juices of plants and fruits, but the female is a blood sucker, and, in certain species, transmits malaria and other diseases to man. She deposits her eggs on stagnant water, usually fastening them together so as to make a raft which floats. The large ends of the eggs are downwards, and it is out of them that the larvae dive down into the water. Enlarged representations should be made of the raft of eggs, also of the larvae, pupae and winged insects, from actual observations with a lens. Records should be kept of the dates (1) when the wrigglers were first under observation, (2) when they moulted, (3) when they changed to pupae, and (4) when the insects appeared.

The lesson would not be complete without reference to the hygiene underlying larval destruction.

One of the most obvious lessons that can be learned from leaves is that nature is not monotonous.

4. The shapes of leaves

There is an endless variety of form among leaves, though they may be grouped into certain types for purposes of classification. After a full study of a leaf and its environment it is sometimes possible to suggest an interpretation of nature's design in giving it a particular form, but it is unwise to seek for far-fetched explanations of the various shapes.

Every keen student of nature wishes to recognize the plants he comes across, and, in the absence of flowers or fruits, he may be able to do this, provided he knows the shape and character of their leaves.

(1)

For the following lesson on the *shapes of leaves* the materials required are mounted specimens of a number of leaves systematically arranged by the teacher; also fresh leaves of the plants—one for each pupil

Method.—Show the pupils leaves of the yam and of the portia tree, and ask them to point out how they resemble each other Elicit the fact that they are *heart shaped*, by holding the pointed ends downwards. Compare them with the leaves of the mango, banyan, plantain, etc., and obtain from the pupils suitable descriptions of each of these leaves.

Examine a leaf of the sacred lotus. The stalk is inserted at the middle Note the fact that the leaf resembles a *shield* or native umbrella

The leaves of grasses, e g. rice, bamboo, sugar-cane, are described as linear. Why ? Point out here that the leaf of the bamboo has a stalk, and thus resembles the other leaves so far, but that grass leaves generally have sheaths instead of stalks

Among long-tipped leaves those of the peepul tree may be mentioned It is an easily wetted leaf which hangs downwards, and is provided with a long tip, known as a ' drip tip '. This probably helps the leaf to get rid of rain water quickly, which, if not so removed, would have an injurious effect. Other leaves have other devices for the same purpose, but these may be studied in another lesson.

Drawings of all leaves studied should be made by the pupils in their exercise books.

(ii)

Material.—Leaves of brinjal, shoe-flower, bitter-gourd, tapioca plant, cotton tree.

Method —The margins of the leaves studied in the previous lesson were in some cases smooth and even (i e. entire), while others were slightly notched or cut into

Look at the edge of a brinjal leaf, and observe that it curves outwards and inwards. Elicit that the margin is *wavy*.

Examine the leaf of a shoe-flower, and obtain from the pupils that the edge has sharp teeth pointing towards the tip. Is any part of the leaf entire ? How would you describe this leaf ?

When a leaf is cut about half-way down, the incision being somewhat rounded and regular, it is said to be *lobed* The leaf of the bitter gourd shows ' lobing ' well Compare the lobes of the leaf with the lobe of the human ear.

There are leaves which look as if they had been almost split up into separate parts. The tapioca plant has such a leaf, the incisions being sharp, and extending almost to the base. This leaf is said to be *cleft* If the leaf had been cleft completely to the base, five separate parts, each shaped like a leaf, would have been the result. Such complete separation is seen in the leaf of the Indian cotton tree, each separate part being called a ' leaflet '.

In some leaves the separation into leaflets is due to the incisions extending to the middle vein or midrib, e g the coco-nut leaf Compare with it the leaves of the coral tree, the rose, the tamarind, and others It might be well to show by the use of paper models how one type of leaf can be converted into another.

Of what advantage is it to a leaf to be (1) lobed or cleft , (2) divided into leaflets ? How is the plantain leaf, which has such a large surface exposed, enabled to resist wind-pressure ?

In continuation of the above, lessons may be given on (1) leaf arrangement, (2) venation of leaves, (3) small leaves, e.g. of the potato and prickly-pear plant

Most leaves have a green colour, which is due to the presence of a substance called chlorophyll.

Can chlorophyll be extracted from the leaf? Experiment (1) with water and (2) with alcohol. Grind about a handful of grass leaves with sand in a mortar (why use sand?), and pour a small quantity of water on them. Filter. Is the liquid green? To obtain a dark green solution use alcohol instead of water. Fill one test-tube with the alcoholic solution in such a way as to exclude air, and partly fill a second tube Leave them exposed to strong light for some time and note any difference.

5. The green colouring matter of leaves

Repeat the experiment with the tubes in darkness. The pupils should write a description of the experiment, with the conclusion arrived at regarding the effect of light and air on the green solution.

Every one has noticed that the under surface of a leaf is generally lighter in colour than the upper

6. Difference between the upper and under surfaces of leaves

The cause of the difference cannot be easily demonstrated to young pupils, as a microscope is necessary. But a simple experiment will prove conclusively that the two surfaces are differently constructed

Material.—Leaves of the india-rubber plant (*ficus elastica*), copper wire, rubber tubing, vaseline

Method.—Each pupil should fit a short piece of rubber tubing on the stalk of the leaf, and close the open end of the tubing with copper wire. Half of the pupils should smear the upper surface of the leaf with vaseline, while the other half does the same with the under surface The leaves should be hung on a cord stretched across the room In a few days one half of the leaves will have folded, while there will be no apparent change in the others Explain Senior pupils may record the weights of the leaves daily for a week, plotting results on squared paper.

7. A study of the okra plant from germination to fruiting stage

The teacher provides the seeds, and asks each pupil to rear an okra plant either in a flower pot or in a suitable part of the school garden. The pupils are thus led to ask many questions, e.g. :—

Why should the seed be sown thinly?
How much soil should cover the seeds?
How often should they be watered?

For three months they are carefully observing the various stages of growth, recording their observations, and vying with one another in producing the best fruit. If full notes are taken through the whole growth—number of seeds set per unit area, thickness of covering, position in sun, etc, the experiment may be instructive in many ways.

The development of the leaves, their spiral arrangement, the longer stalks and wider blades of those below, the hairs on the fruits, any insects which attack the leaves or fruit and the result of their attack, also the life-histories of such insects in the vivarium, are subjects for study while the plants are growing.

Simultaneously the pupils may be engaged in the study of the modes of germination of the coco-nut, mangrove, etc., sections of these being made, to show their structure. They may also make coloured drawings, true to nature, of specimens of leaves, flowers, fruits, etc., and systematically arrange such specimens with the aid of the teacher.

'Without a collection a man's knowledge of natural history becomes nebulous, and his pursuit of it *dilettante*,' says 'E H A.' in his book, *On the Prowl*.

Some hints for the collector: collecting and preserving insects

In India the field of work open to the insect collector is enormous, and if it were possible to interest teachers and pupils of secondary schools in the study and collection of insects, large additions might be made to our scientific knowledge of them.

The outfit required consists of a net, an umbrella, a good lamp, pill-boxes with glass bottoms, a killing-bottle, setting-boards, pins, forceps, an insect cabinet.

Insects on the wing are generally caught with a *net* which may be constructed in the following manner: Take a piece of stout copper wire about $3\frac{1}{2}$ feet long, and bend it in the form of a ring. Insert the two ends *A* in a copper ferule to which is also fixed a bamboo rod 4 or 5 feet long, as a handle. A sack made of mosquito netting, dyed green (why green?) and about $2\frac{3}{4}$ feet deep, should be sewn to the ring. For catching aquatic insects in tanks and streams a net made of strong lace is used.

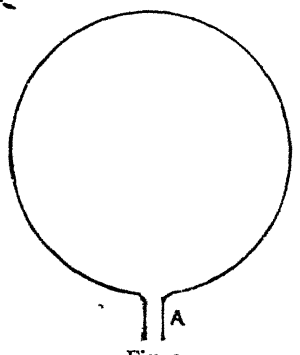


Fig. 2

When an insect alights on a flower it may be swept into the net, if on the ground, the insect may be captured by quickly covering it with the net. Butterflies and moths are easily netted, since they generally fly upwards when an attempt is made to catch them.

When not on the wing, insects may be captured without a net. They should be looked for in flowers, under stones, at the roots of plants, in the bark of trees, etc The favourite haunts of mosquitoes are curtains, clothes that are hung up, and any dark corners of rooms during the day time. The skilled collector is able to catch many insects by holding an inverted umbrella under a tree, and beating the overhanging branches with a stick. The smaller and more delicate specimens should be transferred at once to pill-boxes with glass bottoms, where they are kept alive until the collector reaches home, since they can be *set* most satisfactorily just after death, and it may not be convenient to carry setting-boards in the field Larger specimens, e.g. butterflies, may be placed at once in the *killing-bottle* An excellent method for catching nocturnal insects is to attract them by means of a bright lamp.

After their capture the first step is to kill the insects, and for this a killing-bottle is generally employed Two such bottles should be included in the outfit, one for the larger insects, the other for the smaller An ordinary prune bottle, fitted with the usual metal top, serves the purpose well for the former, while for the latter a wide-mouthed bottle about three inches high by two inches wide, and having a metal screw top, is found convenient. Mix potassium cyanide in small lumps with an equal bulk of dry plaster of Paris, place the mixture in each bottle to the height of about one inch, add about half an inch of liquid plaster of Paris, and allow the whole to set. The two bottles are now ready for use. Potassium cyanide is deadly poison,

and therefore must be handled by the teacher with the greatest care. Ammonium carbonate may be substituted, but not to kill insects which are green in colour, as ammonia fumes bleach them. In a minute or two the insect is killed, and should be *set* immediately.

Some insects, e.g. beetles, may be killed by throwing them into boiling water. If small enough to be placed in a test-tube they may be quickly killed by dipping the tube in boiling water. Butterflies are easily killed in the net by pinching them at the point where the wings are attached to the thorax, the wings being held in an upright position.

Before they are ready for display insects must be mounted, and their wings expanded on setting-boards. A setting-board has a groove in the middle, into which the body of the insect fits; the insect is held fast by a pin passed perpendicularly through its thorax (generally), its wings being spread out laterally. The expanse of wing determines the width of board used, and the size of its body decides the depth of groove. To keep the wings expanded narrow strips of paper are stretched across them, the ends only of the paper being pinned to the setting-board. A number of such boards may be placed one above the other in a box, out of contact with each other. When dry, and after their wings are rigid, the insects are ready for the cabinet.

Two obstacles to permanent preservation of specimens are dampness and attacks of insects By sprinkling powdered naphthaline on the bottom of the cabinet it is possible to deter insects effectively. In the rainy season dampness, which induces moulding and rotting and consequent evils, must be constantly guarded against. The cabinet should therefore be air-tight as far as possible

The bottom of the cabinet should be lined with 'cork carpet', as this holds the pins well Butterflies, moths, flies, mosquitoes, bees, wasps, ants, etc., should be pinned through the middle of the thorax. In dealing with small insects it is convenient to 'stage' them, i.e. place them on a small cardboard disc so that they may be kept at the same level as the larger ones. The insect is pinned in the usual way, the pin being passed through the middle of the disc, as in the diagram. Insects should be mounted high on the pin, and the pins should always be fixed perpendicularly, both in the setting-board, and in the cabinet.

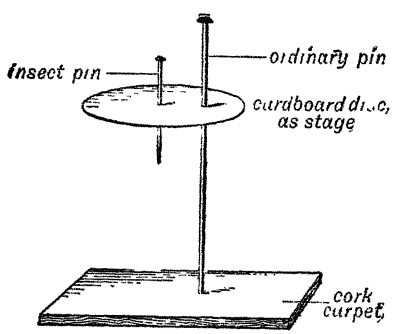


Fig 3.

(N B.—Insect pins are obtainable from D. F. Taylor & Co., Birmingham In India it is important to use *nickel* pins)

How to preserve and mount leaves

For preserving leaves the following materials are required: sheets of blotting paper to absorb moisture from the leaves; two wooden boards, somewhat larger than the blotting-paper, to distribute pressure evenly and prevent crumpling; weights of any kind, e.g stones; a ledger containing about fifty pages of foolscap in which specimens are to be mounted, powdered naphthaline to prevent damage by insects.

It is necessary to dry and press the leaves before mounting them. This is done by placing on one of the wooden boards a few sheets of blotting-paper, laying the specimens to be dried, side by side, on the surface of the paper, and covering them with three or four sheets in such a way that they fit exactly over the area of the paper upon which the specimens are lying.

Upon the top sheet of paper place other leaves, side by side, and cover them, in like manner, with blotting-paper. Continue in this way, alternating layers of leaves with sheets of blotting-paper, until the pile is a few inches high. The top board should then be placed upon it together with a weight of 50 or 60 lb.

If the sheets become damp they should be replaced by dry ones after twenty-four hours, and the pile again exposed to pressure for a day or two.

When the specimens are quite dry, each pupil should preserve a set of them for reference and as a record.

It has been found convenient to mount them on alternate sheets of a ledger by fixing the leaf stalk and the apex with strips of gummed paper. Two specimens of each leaf should be mounted on the same sheet, thus showing both surfaces.

A classification of the mounted specimens is of educational value. They may be arranged according to their margin, venation, mode of attachment to stalk, etc.

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CHAPTER 12

THE TEACHING OF DRAWING

Drawing as it often is

In the majority of schools the teacher's work consists of distributing amongst the boys a number of drawing copybooks from which a certain diagram is selected; the boys are then told to copy this diagram into their own blank books. During the progress of the lesson the teacher sits in a chair facing the class, and from time to time interested boys bring up their books for correction and guidance The diagram is probably a representation of some conventional piece of ornament, meaningless to both teacher and pupil; and the latter finds his work to be only the reproduction of a few exceedingly difficult and uninteresting lines, the lines only to be obtained after infinite labour. This subject is known as freehand, and anything less free or less educational it is impossible to conceive

Let us suppose the lesson is model drawing. The room and its fittings are probably in most cases quite unsuited to the work. Frequently the boys are in the ordinary class formation, i.e. in rows, with only one or two boys directly facing the group, instead of every boy having an unobstructed view. A group of geometrical models is arranged, and the boys are left to make as best they can a drawing in outline of the group set up before them. They have never been taught the simple rules that control the appearance of objects, because the teachers themselves have either never been taught them or have forgotten all about them.

The only reason these boys are learning to draw from geometrical models is that most forms seen in nature and in manufactured articles are based upon a geometrical construction or design. The simple forms found in geometrical solids form an easy introduction to object drawing, and the principles relating to their construction and appearance in perspective will, if properly taught, enable a person to draw anything he may see. This fact is apparently not understood at all. In a few schools we find blackboard drawing and brushwork, but again the reason for teaching these two subjects is not understood.

Geometrical drawing is generally taught, but it does not appear to be taught with the idea that this subject is a practical method of solving certain problems, and of showing on paper the method of their solution. It is too often merely a reproduction without aim or meaning of a figure given in the Geometry book

Thus Drawing, as taught in many schools in India to-day, does not get at the brain, train the boy to see, make him understand, help him towards any career for which he may be specially gifted, or teach him to appreciate beauty of form, colour, or arrangement.

Aims of teaching Drawing

Before adopting any system of Drawing instruction it is of the highest importance that a clear conception of the aims and possibilities of the subject be realized.

A well-conceived scheme of Drawing instruction intelligently carried out, in correlation with the course of true Nature-study, should

gradually awaken the pupils' interest and delight in the world which surrounds them, and should instil an appreciation and love of beauty in form, colour, material, and arrangement, as well as a regard for utility.

It should cultivate in them the habits of accurate observation, and the power to represent faithfully in different mediums the results of their observations.

It should also develop their inventive and imaginative faculties, and create a taste for good form, colour, effective decoration, and harmonious arrangement in their homes and surroundings.

Training to think

The subject is one which is taught very largely through the eye, but it must be always remembered that the eye is the window of the mind, therefore the Drawing lesson should not only be the training of the eye, but must indeed, to accomplish our aim, train also the mind through the eye aided by the hand.

In times past this view has not been given the consideration that it should have received, and by many educationists of even the present day the Drawing lesson is regarded merely as a period of mental relaxation.

The Drawing teacher must remember that his share in the training of the young is a very important one, and the fact that he is really training the brain must always be uppermost in his mind.

Training to see

Teachers of experience know that the difficulty in teaching this subject is not in training the hand to draw but in training the eye to see intelligently what to draw. A good drawing is not one of exquisite finish, but one which conveys to the educated mind the appearance of certain facts most clearly and ably.

The cultivation of the ability to see correctly should then be the chief aim of the teacher of Drawing, for, if the eye can see, the training given will usually be quite sufficient to enable the pupil to make a reasonable representation of the subject.

The teacher should remember that each drawing that is made is a more or less complete description of the subject, and that, whereas the writer has only the possibility of giving a written description of it, the artist or draughtsman has the power of appealing to the mind without wading through a mass of words, his representation, if good, is such as will immediately on sight tell the complete story, or make a series of facts absolutely clear

The cultivation of such a power is no mean thing, and it behoves us to inquire carefully into the means of securing it.

In training the eye to see, we should begin with a consideration of the child's earliest efforts. It will be noted that a child always seems to be interested in detail and seldom in the thing as a whole. The cultivation of the power to observe the larger and simpler facts regarding the object to be drawn is one of the most interesting and necessary points in teaching observation to a child.

Nature has certain ways of giving us information about herself which, if studied closely, will help us to acquire a great deal of information that would otherwise be hidden from us. Infinite though the ways are by which Nature reveals herself to us, if we notice the following points when studying almost any object, we shall realize a great deal about it that we should otherwise overlook.

Take any object and we see first its form ; by this is meant the shape of a thing—not its outside form only but the contour of its surface as revealed to us by its *light and shade* If the object has length and breadth only, it can be described as flat or having no thickness, and will have no light and shade on itself ; but, if it has *length*, *breadth*, and *thickness*, it will possess light and shade. This third dimension, or thickness, can have an infinite variety of projection with its consequent *light* and *shade* and *reflection*, and according to the quality of surface we get not only the *texture* of an object but also the qualities of *transparency* or *opacity* ; in addition, an object may be of any *colour*.

A child of the first year's primary class will not be able alone to detect all these points, and it is not desirable even that they should all be pointed out ; but a boy of the middle section will, if taught properly, be able to explain to his teacher what he sees ; whilst a youth in the upper section should be able to represent what he sees with sufficient fidelity for his representation to be completely understood by an equally intelligent person who has never seen the original

Powers of observation grow gradually

In all observation lessons it should be the child who is observing, not the teacher ; it should rather be the teacher's work to draw attention to points of character and interest and for the pupil to observe and represent in his own way as well as he is able, from previous experience, the object he is studying. The resulting work will be far more interesting as representing the originality and ability of the child than would have been the case had all the drawings of the class been alike and only representative of the mind of the teacher.

The teacher should lead the child to see only as much as he is capable of understanding, but the understanding of the pupil should always be a little in advance of what he can represent ; for the mind must always be kept in front of his ability to draw, or he will stagnate and the subject will no longer be a means of education.

Choice of descriptive words

In describing objects to a child it is necessary to be very careful in the choice of words, not only that he may understand them, but also that he may not receive a false impression. Do not say that a drawing-board is ' square ' or that an orange is ' circular ' or ' spherical ' ; rather take pains to prove to the child that these are not true descriptions.

Appearances

So far in dealing with observation we have been dealing with facts which can be proved , but one of the greatest difficulties the teacher will have to contend with is that he has not to train his class to present in a Drawing lesson actual facts but rather the appearance of them. It will become necessary for the class to control and repress their knowledge of the facts, and concentrate their energies on the representation of the appearance of the object under study. Drawing is a subject which deals with the appearance of things—their beauty or ugliness. The appearance of things has a great influence on character, and the question of beauty and ugliness in art and nature enters more largely into the affairs of everyday life than we are conscious of People compelled to live amidst ugly and mean surroundings will probably have minds of a corresponding kind.

This question of the appearance of things therefore has a far-reaching

effect, and it behoves the teacher, who aims at cultivating the taste of his pupils, to see that he surrounds his class with interesting and beautiful things from which to study, and that he constantly brings to their notice what is beautiful in nature, so that they may be taught to appreciate the beauty that is free to all and so find pleasure in innocent things.

How far can present methods be retained?

Having considered the general aims of teaching Drawing in schools in India, and noted some considerations to be kept in view when giving instruction to children, we must see now to what extent we may retain our present methods and where new methods must be adopted.

Copies

If the Drawing course is to achieve the aims outlined above, there can be no place in it for diagrams of ornament, etc, either printed or drawn; these are abstract conventions, imperfect sources of information, and only representations in a very limited sense of objects or ornaments. The use of diagrams or copies deprives the pupil of the really intellectual part of his training, i.e. the study and interpretation of realities

Origin of copies

The freehand drawing of the present day is an abuse of an excellent idea: at the renaissance of art applied to industry, at the 1851 Exhibition in England, it was seen that ornament was really bad, and a number of schools were started to encourage design as applied to manufactures. The Government then issued a number of diagrams of renaissance ornaments with the intention that they should be learnt and used; when these patterns became stale other patterns of historic interest possessing beauty were added to the collection and used, but always with the idea that a series of patterns so learnt should become a storehouse of material for the designer. When, however, they were used as an easy way of teaching Drawing, abuse arose, and has spread to India, so that we now have books of copies of unintelligible lines, paralysing to any pupil gifted with ability to draw.

SOME POINTS IN CLASS MANAGEMENT

Use of blackboard

The teacher should make considerable use of the blackboard, but he should be very careful how he uses it during the course of the lesson. The objections to a printed diagram apply with equal force to a drawn one; the board should chiefly be used to illustrate a principle or method of Drawing, and the boys should never be allowed to use the sketch made by the teacher as a diagram to be copied

The teacher's position in the classroom

The teacher should either be standing, drawing on the blackboard, instructing, or questioning the class; or he should be moving about the room demonstrating individual mistakes and their remedies. He should seldom if ever use his chair as a seat, but he should remember that it makes an excellent subject for a lesson in object drawing for the boys of the upper classes

At the commencement of the lesson the teacher should talk to his class as a whole, and so obtain their attention.

He should take the object to be drawn in his hand, or if too large, it should be placed where it can be seen by all. He should point out its general

shape, proportions, characteristics, and peculiarities—thus differentiating it in the minds of his pupils from objects they have previously seen and studied Then he should question the pupils in order to find out whether all have understood.

The preparation step in the Drawing lesson

Should the object present any new difficulty, or should its representation require any new method of execution, he should by large-scale sketches (in the same method of representation as is to be adopted by the pupils) show them how to produce their drawings. Care should be taken to point out that no two boys will see the object alike; therefore, in the drawing of a particular object each boy will have his own problem to wrestle with and his own difficulties to overcome; no two drawings should be exactly alike.

Five to ten minutes so spent by the teacher will save the boys twenty to thirty minutes of alterations and corrections, and will help to produce clean and neat drawings.

The point to be emphasized here is that time spent in observation and consideration at the start of a lesson will result in far more intelligible, cleaner, and more characteristic representations being made than when pupils are left to themselves.

The enthusiasm raised in the Drawing class, if this method of giving instruction is carefully carried out, will be great, and a rapid evidence of improvement in the boys' work is certain to follow.

A slovenly attitude means a slovenly drawing, and nothing should be more abhorrent to the teacher and pupil than slovenliness

Posture

In starting the work of every class each year great attention should be paid by the teacher to the way the pupils set about their work. They must be made to *sit straight*, with their shoulders parallel to the desk on which they are drawing. The block on which they are drawing should occupy the centre of the desk.

The teacher should hold a pencil correctly and demonstrate to the class how they should use it, and see that his boys are always working properly. The worst of all offences should be the wetting of a pencil.

The arms should never be allowed to sprawl on the desk, nor should one foot be placed on the other or wound round the legs of the stool, nor should the chin almost rest on the desk. Nor should a pupil when drawing on the blackboard be allowed to stand nearer to the board than a straight arm will allow

These are simple errors seen every day in the Drawing classrooms of the schools of India, and must be corrected, for the sake of the health as well as of Drawing.

MATERIAL CONDITIONS

The following points among others will, if carefully studied and applied with common sense to the conditions under which the subject is taught, be found to have a very beneficial effect on the class work.

The room devoted to the study of Drawing should be large and airy, well but simply equipped, and properly lighted.

The room

It must be lit from one side only—as nearly north as possible. It will then be unaffected by sunlight, and the appearance of an object with its light, shade, and shadow will practically be the same

at any time during the school working day and all the year round The windows should be as few as possible, one large one being most suitable, the bottom of the window should be at least 6 feet from the floor level and should not be screened by a verandah.

Only one class should, as a rule, be taught at one time in a room, but it is possible in the upper classes where the numbers are fewer to have two or three standards of work done by different sets of pupils from one object at one time

The room most convenient for general purposes is approximately square in shape; long, narrow rooms, or L or T shaped rooms are not suitable for class work

Its arrangement

Three arrangements are necessary for object drawing. (1) in which a single object or single group of objects is presented for the class to draw; (2) when the objects are flat and two or three are required, such as kites, or (3) when each pupil is provided with a separate object to copy, such as a feather, a leaf, etc.

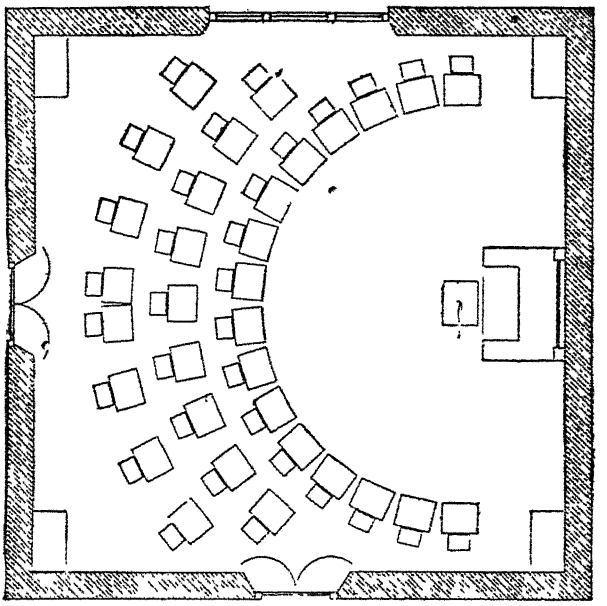


Fig 1 Diagram of Seating in Half-circles

In all cases a large movable blackboard 4 feet by 7 feet should be attached to the wall for demonstration purposes by the teacher. On a raised platform 9 inches high in front of the blackboard should be placed a convenient table (with drawers for the teacher's use) to act as a demonstration table. A separate desk for each pupil with separate seat should be used for general work.

1. When a single object or single group of objects is arranged for study it should be placed to the front of the demonstration table, and a half-circle of pupils' working desks placed round it. The resulting drawing will be perspective representations of the object or group, dissimilar from one another,

as the group is being seen in perspective from a different angle by each pupil; but care must be taken that each individual pupil's desk is exactly opposite the object to be drawn.

2. When a flat object is being drawn by a junior class, for example, a kite, three or four specimens should be arranged on the wall behind the teacher and the pupil's desks arranged in rows behind one another, so that each pupil will get a clear straight front view, or nearly so, of the object he is drawing.

3. When each pupil is drawing from a separate object such as a leaf or feather, the object may be placed on the desk or held in the left hand, either arrangement of the room is suitable provided the object is properly seen

The one essential in these different arrangements is that each pupil should be able to see clearly the object he is to represent, and that he should be in such a position with regard to it that he may have every facility to accomplish what his teacher has set him to do.

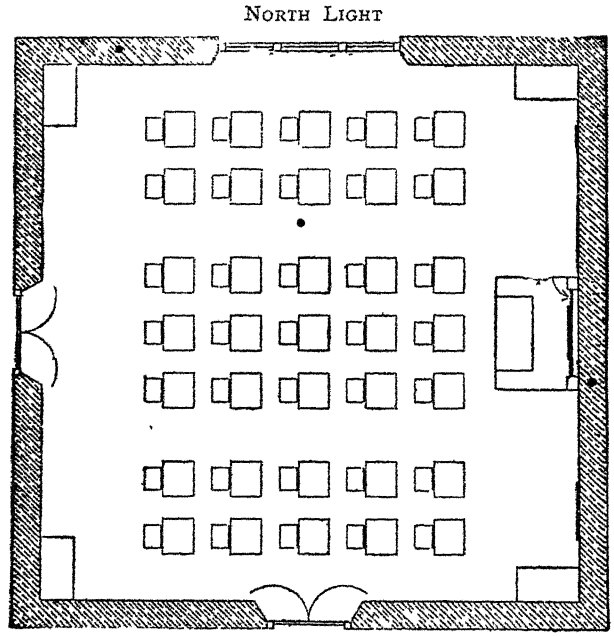


Fig 2 DIAGRAM OF SEATING IN ROWS

Furniture

It will be seen later, in the syllabus which follows, that objects may be represented in various ways; in order that this may be done with reasonable accuracy suitable furniture and apparatus are necessary.

So far as sitting work is concerned, a uniform desk-height may be adopted with varying height of stools, to go with the desks; this would form the most economical and satisfactory method of accommodating pupils of all ages A diagram is given (p. 226) of a simple and satisfactory desk Two stools

go with each desk, one being 16 inches and the other 20 inches in height. The higher stool is used by the junior classes, whilst the lower stool is used by the senior classes, who will require also the higher stool as a stand for water, colour-box, etc , in water-colour work.

Blackboards

In addition to the fixings already specified, drawing on a vertical surface must be arranged for by blackboards suitable for all the classes attending

A cheap and good method is to have the walls at the sides of the room, from a height of 2 feet 6 inches to 6 feet 6 inches from the floor level, plastered with a cement surface which may be drawn on with chalk; this surface should be framed with wood and at the bottom edge there should be a shelf of 6 inches projection, forming a ledge to hold chalk, etc. This shelf also has the advantage of being useful for supporting boards for upright brush-work or other study; it also provides a means of arranging the class work for general criticism before the whole class.

The disadvantage of the plastered wall as a surface for large-scale drawing is that, if the objects to be drawn are in the centre of the room, the pupil has to turn his back on them to draw, and therefore cannot easily compare his drawing with the objects. For all other types of large-scale chalk-work it is, however, an excellent arrangement.

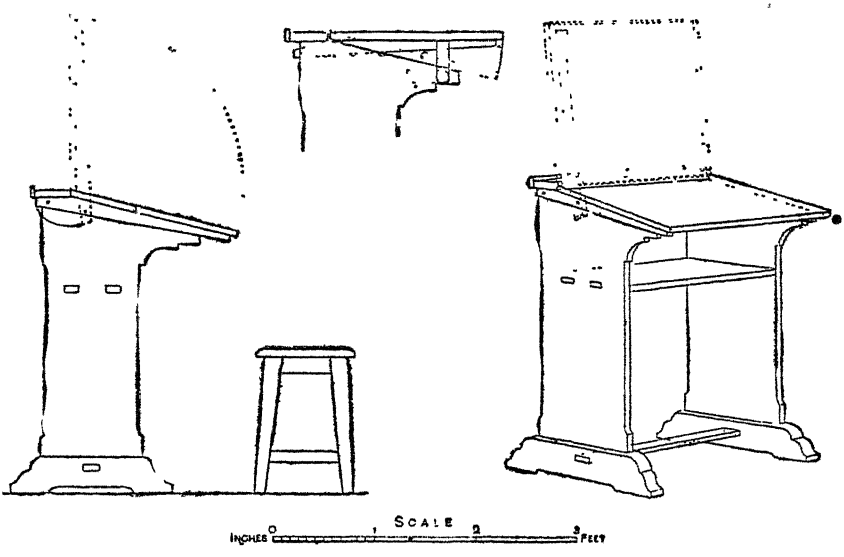


Fig 3. Convertible Drawing Desk, Table, and Blackboard

The lid of the desk is movable, and may be used in three positions, viz sloping, level, and upright

Sloping—for general drawing purposes.

Level—the lids may be raised and supported in the horizontal position by means of the small movable blocks screwed inside the supporting sides as shown in the sketch This position is useful for all classes when modelling or painting

Upright—the lid may be raised to the vertical position, and held in position by the projecting batten, and the inside of the lid will, when painted to a dark colour, form an excellent blackboard.

A more expensive but perfect arrangement is a two-sided framed blackboard, hinged to the wall on one edge and opening out at any angle with the wall. These boards should be about 3 feet wide and 4 feet high, and should line the side walls of the room ; then, no matter where the object to be drawn is placed, it and the drawing can be seen at the same time.

Along the wall to which is attached the teacher's blackboard should be placed almirahs, for the storage of objects to be drawn, the class work of the students, materials, etc There should also be framed boards for the exhibition of the work of the top boy in each class for the previous week. This weekly exhibition will be found to be a great incentive to careful work. On the opposite side of the room should be shown the prize work of the previous year, the best of the clay models, and specimens of work lent by other schools.

If a teacher shows the class his interest in their productions, and is not afraid to let these be seen, the pupils will have confidence in him, and will work with greatly increased zeal

Materials

In any subject having reference to art it is certain that good work cannot be produced without good tools , especially when the executant is only a learner. Fair drawings are at times produced under bad conditions, with inferior tools , but, done under good conditions and with good tools, those same drawings might have been masterpieces.

In India good tools are not always available , but with a little forethought and organization much better tools and materials might be obtained.

Most of the work may be executed on the blackboard and white cartridge paper. White cartridge paper may be purchased in every town of any size in India. This is used in schools in sheets and in the form of books.

The book method has the advantage that a particular pupil's work may be seen at any time, but in these days, when inspection and supervision are important in school affairs, it would seem advisable that the whole work of a class at any particular lesson may be available

An improvement on the book is the block, which consists of a number of sheets of paper fastened at three edges to a stout card. Thus one surface only is available at a time, and when this drawing is complete the sheet is removed and the next sheet is exposed, and is ready for use. The advantage of this is that the whole of the work of the class at one lesson can be seen at the same time and the work of the class can be filed together in the almirah for reference, inspection, and easy marking by the teacher. Other advantages are : the block can always occupy the centre of the desk, there are no loose leaves to flap about, a bad drawing need not be filed, all the boys' work is of uniform size, and, as the T-square can be used on the edge of the block, no drawing-boards are needed The block is equally suitable for upright or horizontal use. A convenient size of block for class purposes is 10½ inches by 12½ inches (royal quarto), but blocks of twice this size for upper classes might be advantageous. Similar blocks of coloured papers for use with coloured chalk, crayon, and water-colour will be found convenient.

The point generally used is the lead pencil, but other points also are necessary. For blackboard and coloured paper work, chalks of various colours are suitable points for all classes For work on cartridge paper a

lead pencil of good quality of the grade known as H.B. is sufficient for object drawing. For geometrical drawing an H.H. pencil for the working of the problem, with an H.B for 'lining in' the result, is all that is necessary. A great economy will result from the use of hexagonal pencils, as they do not roll off the desk and break their points. Good pencils are more economical than cheap ones, and the work produced by them is of better quality.

The drawing point

Good rubber is essential, and that for general use should be fairly soft but firm Many drawings are spoilt through the use of a bad rubber.

Erasers

For most of the work done in school those colours known as students' colours are sufficiently good; in the main they are the same colours as artists use. They are not so finely ground nor so true in colour, but these are points of minor importance and do not affect the requirements of pupils except in the highest classes where they specialize. Boys in the ninth and tenth classes (the two highest classes) must supply themselves with boxes of the best artists' water-colours; but the box need not contain more than about ten colours, a list of useful ones being the following: cobalt blue, Prussian blue, vermilion, alizarin crimson, Indian red, burnt sienna, yellow ochre, raw sienna, Indian yellow, brown madder.

Water-colours

Brushes must be good and require great care or they will not retain their points; the point is the essential part of the brush. For all the work, except in the higher classes in which boys specialize in drawing, two brushes will be sufficient, Nos 4 and 7, and these should be of sable, as they are much better and more lasting. Boys specializing in Drawing in the higher classes must have four or five good brushes of their own, excellence in execution is expected of them.

Brushes

Rubbers, pencils, chalk, brushes, etc., offer temptations to schoolboys; consequently petty pilfering is not uncommon in the Drawing classroom. The teacher should remove temptation as far as possible by keeping these materials under lock and key and, with the assistance of the monitors, checking them at the end of the lesson. When petty theft of this kind does take place the teacher should inflict punishment severe enough to make clear and sharp the distinction between 'mine' and 'thine'.

Care of materials

THE DRAWING COURSE[1]

To avoid the errors of the past it is necessary to draw up the course on an entirely new basis, and to those unacquainted with modern methods the syllabus here suggested may appear revolutionary and impossible; but with a teacher trained for the work, the establishment of such a course will be of great value, not merely as drawing, but as a general educational training.

General principles

[1] In what follows the nomenclature of the classification of the United Provinces has been adopted. In these Provinces the lowest class is the preparatory class (usually divided into two classes, A for the first half of the first year, and B for the second half). Then follow class I to class X, the latter being the final class of the school course *Mutatis mutandis* the course here outlined may be applied to the classes in other provinces.

Considering the educational value of the course and its help in the teaching of other subjects, Drawing should be compulsory in all classes up to and including the sixth class. From the seventh class upwards only those need take Drawing as a separate course who intend to use it in a professional capacity. For this reason the syllabus has been carefully thought out to meet the requirements of young men likely to enter such institutions as Engineering Colleges, Technical Schools, and Schools of Arts and Crafts.

Drawing is to be looked upon by the teacher as incidental to all the subjects of the school curriculum, and hence it is imperative that the instruction given should be such as will enable it to be brought into close relation with and to be of real help to all the lessons given by other teachers. Drawing is as necessary as writing as a means of self-expression Hitherto Drawing has not been considered a serious subject, and other class-teachers have not seen that it has any bearing upon their particular work. The idea of correlation has been kept in view in framing the syllabus here proposed, and radical changes have been necessary in order that it might be removed from its isolated position and brought into prominence as one of the necessities in the education of children.

It will also be noticed that the greatest importance is now laid upon the teacher's own work in class, as instructor, leader, and guide. He is no longer to rely on a series of published examples and stereotyped model forms. These will now only take their proper places as formal examples ; but it is the teacher who is entirely responsible for demonstration, guidance, and class instruction. Instruction by conversation must be employed, and observation both by sight and touch practised. The intelligence of the class will be developed, their vocabulary enlarged, and their interest stimulated. Thus the Drawing lesson should be of great help to the conversation and composition of the upper classes, and to the expressional powers of even the lowest.

The reason for the present low standard of Drawing is because the teacher himself has found it uninteresting. Where new courses are proposed they should be laid down on fairly clear and definite lines, but should leave the teacher free to arrange its details in an interesting manner. The result should be a great incentive to the work of the boys and the discipline of the class, and at the same time an added interest to the work of the teacher, who, it is hoped, will attend to all his pupils individually, and will no longer content himself merely by supervising the work of a few smart boys or by preparing work for his own glorification.

Particular attention should be paid by the headmaster to the schemes of work drawn up by the teacher for each session, so that progressive continuity may be ensured throughout the whole training. Drawing should be general throughout the school, but specialized in classes VII to X.

By *general* it is understood that the pupils in addition to working through the syllabus laid down should be taught to illustrate as far as possible every subject in the curriculum where illustrations are required. By *specialized drawing* is meant drawing which will, after a boy has taken his School Leaving Certificate Examination, enable him to take up technical work

It is suggested that the old subdivision of the subject into freehand, model, and geometry should no longer exist, and in their places we should have object drawing, memory drawing, modelling, design, and instrumental drawing.

Object drawing

The careful study and more or less complete representation of actual objects, natural and artificial, large and small, singly and in well-arranged groups, should be regarded as the foundation of all instruction in vernacular and English schools, this has been kept prominently in view in arranging the syllabus. Since the object itself first attracts the eye as a whole, it should, when drawn, be filled in with its general colour, more fully to represent it. The aim and end of teaching object drawing is that by the time a boy has reached the School Leaving Certificate stage he should be able to make a fairly accurate representation of an object.

The geometrical models which are needed to illustrate the construction of the majority of articles in common use are the cube, pyramid, rectangular prism, triangular prism, cylinder, and cone. The more complicated geometrical models would not appear to be necessary and their use should be discontinued. The geometrical models are only required for the purpose of illustrating the construction of common objects; for example, in the drawing of a bucket the teacher should illustrate his lesson by the use of a cone.

Instructional conversation and handling of the object by teacher and class are essential.

Memory drawing

Memory drawing should not be regarded as a set subject but one which the boys may be called upon to have exercise in at any time. It is one of the means of training boys to observe quickly, and store in their minds pictures of what they have seen. This study and practice will, with the knowledge of the rules relating to the construction of objects and the representation of their appearance, enable a boy not only to draw anything that he has seen correctly, but will enable him to illustrate any idea he has in his mind. Practice in memory drawing may be obtained in several ways.—

1. By setting up an object and allowing the boys to see it for two minutes, afterwards covering it. Then after ten minutes' work again uncovering the object so that they may compare it with their drawing, and, after a further two minutes' observation, finish their drawing as best they are able

2. Exercising their memories by reproducing the work of a previous lesson

3. Giving unexpectedly for drawing from memory some object with which they are familiar.

Modelling

Modelling should be given (1) in explanation of objects in the round, (2) when the boys do not fully appreciate the construction or relief of the object they are drawing, or (3) when an enlargement of any part of the object is necessary for the boys' better understanding of it. The modelling exercises are intended to be supplementary to the object drawing course, being given to secure a keener observation and greater comprehension of the object.

Design

Design is meant to be given in the four upper classes only, and should take the same place with regard to a course of Drawing that composition takes in a course of English. It is intended to be an introductory education in taste in decoration. The principles underlying decoration should be learnt in classes VII and VIII, whilst in classes IX and X the boys should be taught how to adopt the beautiful forms they have discovered in their object drawing for use in design.

The choice and harmonious arrangement of colour with the elementary theories concerning harmonies and contrasts should form part of this course.

Instrumental drawing

Instrumental drawing should start in class III and be of a very simple character, gradually advancing and expanding until it embraces geometrical drawing, simple solid geometry, scale drawing, and drawing from actual measurements.

Proposed syllabus

Classes I and II. Memory drawing and modelling in clay of objects to be drawn, with object drawing.

At each lesson the aim should be to make a number of carefully directed attempts rather than one finished laboured drawing. Hence the materials used should be such as can be easily removed, e.g. white and coloured chalk on black *takhtis*.

An effort should be made in the earlier classes to cultivate the memory, and hence the objects that have already been studied and drawn, under the direction of the teacher, should be reproduced from memory.

Modelling should be taken to cultivate observation, and the boys should be given to model objects with which they are familiar, in addition to those which, after conversation and handling by the teacher and the class, are to be subjects of Drawing lessons.

Objects suitable for these classes are chiefly of a flat character, such as sheets of coloured paper cut to different proportions in rectangular and curved shapes, flags, hoops, cricket-bats, tennis-rackets, horse-shoes, set squares, T-squares, etc., also round objects, which have practically the same appearance to each pupil, such as a hockey-ball, football, tennis-ball.

Classes III and IV. 1. Continuation of previous work for the first six months in class III, and after that more advanced object drawing with modelling in clay and memory drawing. 2. Instrumental drawing.

The teaching of the first six months in class III should follow the principles laid down for classes I and II, but on somewhat more difficult lines, as an introduction to the following :—

(1) *Drawing from simple rounded objects* such as a surahi, basins, cones, oranges, papitas, bottles, skipping-ropes, etc., with explanatory sketches by the teacher on the blackboard, and free oral instruction. The boys should not copy from a drawing, but should make a direct drawing from the object, only availing themselves of the teacher's sketches

(2) The application of what has been already learnt to the necessary illustration of lessons in Geography, English, Object-lessons, Nature-study, etc.

The objects now given being of a more difficult character, the boys should have them presented to them in their easiest positions, that is, without difficulties of perspective, so that each drawing should be in the nature of an elevation or simplest view of the object.

NOTE —In addition to drawing in outline and filling in with colour, boys should draw by means of a brush, thereby cultivating greater accuracy and flexibility of touch, and gaining a closer acquaintance with colour

Modelling should continue in these classes, but on more difficult lines, and should give greater exercise to the powers of observation.

Memory drawing should no longer be confined to those objects that have been studied and drawn, but boys should now begin to draw from memory objects which have been submitted to their observation for a short time.

Instrumental drawing by the use of a ruler, divided into inches and eighths, should begin in class III. This drawing should be confined to lines, squares, rectangles, and to the diagonals and diameters of such figures, with the definitions involved.

Lower Middle Section: Classes V and VI. 1. Object and nature drawing with memory drawing and clay modelling. 2. Instrumental drawing, consisting of scale drawing, simple geometrical figures, simple printing.

Object drawing in perspective of things in daily use at home or at school. In order that boys may realize the difference between the actual shape and size of an object and its appearance, they themselves must regularly use the glass plane to draw on, in addition to paper and blackboard. Also the class should be taken outside for the study of buildings and outdoor objects generally.

The glass plane is perhaps the most useful piece of equipment for Drawing classes that exists. Objects presenting difficulties in perspective should be arranged behind it so as to enable the boys to reproduce what they see on it. This lesson if properly taught is more convincing to the backward boy than hours of correction and talk.

Nature drawing from trees and plants as a whole and from their detailed parts, with the study of their different aspects and development in the various seasons.

The production of finished drawings from the studies and sketches made during observation lessons, or any other school lesson which has been illustrated.

Memory drawing of all or any of the above.

NOTE.—Pencil, chalk, water-colour, and modelling clay should be used in executing the work described in the preceding paragraphs

Instrumental drawing. 1. The drawing of simple scales and their application.

2. The construction of simple geometrical figures by means of compases, the protractor, set-square, and ruler

3. Simple printing such as is required for the heading and lettering of maps and diagrams, done between parallel lines with single strokes of the pen.

Upper Middle Section: Classes VII and VIII. 1. Object drawing. 2. Plant drawing and modelling 3. Brush-work design and modelled design.

Object drawing of single objects rather than of groups These should be careful studies of tone, texture, and colour, on blackboard or paper with chalk or water-colours.

Plant drawing in pencil, or outlined brush-work, or direct brush-work The general colour of nature should be represented as closely as possible by one tint. Pen-and-ink drawing and modelling from nature in high relief on a background may also be included.

Brush-work design. The object of teaching this subject is to educate the taste and to develop the inventive faculty, and the work takes the same place in relation to Drawing as Composition does to Writing. Instruction should be given in the elementary principles of design, and spacing and placing Boys must be encouraged to produce their own ideas and should only be assisted by the teacher's explanatory sketches on the blackboard. Not more than two colours should be used. As an alternative to brush-work, the boys should model simple forms in relief, and repeat and arrange them in a design.

Instrumental drawing. 1: *Plane geometry.* The construction of such geometrical figures and problems as can be executed by means of simple instruments.

2. *Scale drawing.* More closely divided scales, and their use in making drawings and diagrams of the classroom and its details.

3. *Printing.*

NOTE.—The teacher should see that each boy has the following instruments of good quality: dividers, pen and pencil, compasses, protractor, ruling pen, scale (6"), and set-squares

High Section: Classes IX and X. 1. Object drawing. 2. Plant drawing and modelling. 3. Plant design in colour and relief. 4. Instrumental drawing.

Object drawing should be of the same character as in classes VII and VIII, but of a more difficult object, or of a small group of objects.

Plant drawing as in classes VII and VIII. The colours of nature should now be represented as closely as possible. Modelling direct from plants or natural objects in relief on a background; the exercise may afterwards be coloured in natural tints.

Plant design in colour and relief. The plants studied in the previous section should now be used as the motives of design. Each design should fill such forms as a circle, square, rectangle, etc., and should be suitably coloured.

Instrumental drawing. 1. *Plane geometry.* As in classes VII and VIII with the addition of the ellipse, the volute, and the oval.

2. *Scale drawing.* A more detailed scale drawing of the room, with its doors, windows, and furniture, etc.; scales as before, including the diagonal scale.

3. *Printing.* As before.

4. *Plans and elevations* of simple straight-lined solids.

Conclusion

The syllabus given above is drawn up on broad lines and yet with sufficient detail to be followed clearly by those adopting it. It is intended to appeal to the energetic teacher who is willing to put his heart into his work, who is willing to depart from the narrow and useless lines of non-instructional Drawing and to think out for himself lessons that shall be interesting and instructive. In doing this the teacher is advised to start with a three months' trial in the lowest class, taking up a new class each three months until the whole of the work of the school has been re-organized. He will find his work hard at first but, as the new ideas expand and are seen to be working in practice, he will feel that his own development and that of his classes have well repaid him for his increased labour.

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Chapter 13

THE TEACHING OF HANDWORK

Reasons for inclusion in the curriculum

Ruskin has said, 'Let a youth once learn to take a straight shaving off a plank, or draw a fine line without faltering, or lay a brick level in its mortar, and he has learned a multitude of other matters which no lips of man could ever teach him.' Educationists are beginning to realize the truth contained in these words, and to advocate that some form of manual activity should have a place in the curriculum of every school.

It is only within comparatively recent years, however, that Handwork, whether of an elementary character, such as paper folding and cutting, clay modelling, and cardboard work, or of a more advanced form, such as wood and metal work, has become a compulsory part of the work of primary and secondary schools in Europe and America.

The conviction that such manual exercises should have a place in the school curriculum is by no means new. In the seventeenth and eighteenth centuries this view was advanced by some of the leading educational reformers.

The main ground, and in most cases the only one on which manual exercises were first introduced into the schools, was that the training given by such exercises would help to equip children of the artisan and labouring classes with such manual skill as would be of value to them in the occupations by which, in after-life, they would earn their bread. But even then it was seen by some reformers that such exercises have a claim to a place in the school curriculum quite independent of their value to those who, in later life, would earn their livelihood by manual work; and this is recognized still more to-day.

In the first place, it is felt that even primary education has a scope wider than the teaching of Reading, Writing, and Arithmetic, and that the cultivation of some form of manual dexterity for its own sake may fairly claim to be one of the objects of a well-ordered system of primary education

It is maintained, too, by leading educationists that the cultivation of manual dexterity reacts favourably upon the intellectual faculties, and is an important aid to their development. Recent physiological research supports this view. It has been stated by recognized authorities in this subject that the development of the higher brain centres is intimately connected with that of the motor centres which control the action of the hand, and which in their turn depend upon it for their development. In any case, it is a matter of experience that manual occupations are a means, in some respects more suitable than other school studies, of attaining certain intellectual and moral results which are of great value in the training of the young. What these results are will be discussed when we consider in detail the aims of teaching.

It is necessary that we should distinguish between two objects aimed at in the practice of manual exercises in schools—the direct and the indirect. The direct object is the acquirement by the children of a general manual

dexterity that shall render the hand a more efficient servant of the brain in whatever calling a lad may choose It should be observed that it is a general manual dexterity that is aimed at, not the special dexterity suitable to a particular trade. The indirect object is the mental and moral discipline already referred to. Of the two objects, while the first cannot be neglected if the second is to be attained, the second is, for school purposes, by far the more important and must be the chief consideration in determining the course of instruction to be followed. Experience shows that it is this aspect of manual occupations which teachers are most likely to overlook and it therefore requires to be emphasized.

Not merely a training in skill

It is perhaps desirable at this point to explain the terms commonly used in connexion with Handwork in schools. They are as follows: kindergarten, hand and eye training, and manual training. The word *kindergarten* is frequently misused as though it were a subject to be taught like Reading or Arithmetic. The term, as used by Froebel, has no reference to a *subject* of instruction, it indicates a *method* of education. It may be described as a form of education essentially directed to play, the children come to the kindergarten to engage not in lessons but in various occupations such as the illustration of stories in clay, or pastel, paper-tearing, stick-laying, etc., and in social games.

Explanation of terms used

Kindergarten

Hand and eye training is the term used in connexion with such occupations as paper, clay, and cardboard modelling, occupations which naturally follow from the kindergarten work and are suitable for the primary classes.

Hand and eye training

By *Manual Training* is usually understood courses in wood and metal, and more recently school gardening. The later tendency is to expand these occupations and include bookbinding, repoussé, pottery, enamel work, etc., under this term The term *educational handwork* is used to denote all forms of school Handwork.

Manual Training

In the early history of the manual training movement the distinction between the direct and the indirect objects referred to above was only dimly recognized and even the direct object of school manual exercises was not always correctly understood. The view then accepted was that such exercises provided a form of training useful to children of the artisan and labouring classes.

History of manual work as a school subject

Accordingly, schools known as 'Schools of Industry' were established in many parts of Europe, particularly in Germany. These were established as primary schools, but, as is pointed out in Dr Sadler's *Memorandum on Manual Training for Boys in Primary Schools in Foreign Countries*, the system which these schools embodied was quite at variance with sound principles of primary education, and it is not to be wondered at that they failed. Two causes of failure may be given. First, in their keen desire for industrial work, as such, they altogether neglected to turn this training to account for the attainment of any object of a general educational character Secondly, the training in manual work given in the German schools of industry was a form of technical instruction adapted to the requirements of particular trades, and therefore quite out of place in a primary school, where such instruction was premature

and to the disadvantage both of primary education and of technical secondary education.

It was on the score of the industrial or economic advantages of manual exercises, rather than in view of their advantages for the purpose of general education, that Pestalozzi at first advocated the introduction of this branch of school work. In his later writings, however, he modified his early view, and laid stress on the general educational purposes that could be served by the special training given by manual exercises in the school. But his change of views came too late.

Dr. Sadler in his *Memorandum* says, 'This side of Pestalozzi's teaching received comparatively little attention, at least so far as the curriculum of the elementary school was concerned.

'In the sphere of primary education Manual Training had become identified with the premature technical instruction attempted in the Schools of Industry. Pestalozzi's followers therefore did not press forward their master's view that manual training and other forms of teaching should be combined together. The result was, that the primary school, though owing the greater part of its improvement to the influence of Pestalozzi and his followers, gradually became too literary in its curriculum, and the last thirty years have seen increasing efforts to repair defects which would never have become serious had Pestalozzi's doctrine been adopted and applied in its entirety.'

Some thirty or forty years ago the movement, now almost universal, for the introduction into schools of a system of manual exercises, arranged with a view to their general educational advantages, had its beginning. In the *Memorandum* referred to we have an outline of the position of Manual Training in European countries, and it is considered of sufficient interest to be reproduced in part:—

Finland

Finland was the first among European countries to give educational Handwork a recognized place in the school curriculum. Since 1866 it has been compulsory in the training colleges.

Sweden

In Sweden the movement for manual work in schools was at first an effort to revive the old Swedish tradition of domestic industry. Fortunately, the experience of Finland led the Swedish authorities to encourage the strictly educational side of the work, and to connect it with the elementary school curriculum In 1875 the well-known seminary for teachers was opened at Naas.

The work of this training school, which was for many years under the direction of Herr Otto Salomon, has been one of the most important agencies in disseminating throughout Europe and America a knowledge of the theory and practice of woodwork as a branch of the curriculum of the primary school.

Instruction in Sloyd woodwork is given in all the training colleges in Sweden.

Germany

Manual Training in Germany suffered from the false start originally made by the establishment of Schools of Industry. The educational value of the work is now fully recognized, and in the Handwork Training College at Leipzig a great number of teachers have been trained. Manual Training is now taught in all German training colleges, and state contributions are made in aid of this branch of school work.

In Britain, Norway, Denmark, Holland, Belgium, Austria, and France Manual Training now forms an essential part of the educational system.

America

In the United States of America the development of Manual Training in schools has been very rapid and very great during recent years, and the idea of the general educational value of such instruction as distinct from its industrial utility seems to be kept well in view

A recent writer says, 'Any survey of American secondary education would be incomplete without a reference to Manual Training, which is regarded in the majority of secondary schools as an integral part of a liberal education.'

India

It is frequently alleged that the study of books has bulked too largely in the Indian educational system, and that it has resulted in a disinclination on the part of the pupils for an industrial or practical career. Whatever truth there may be in this allegation, it cannot be doubted that a strong desire exists among educationists and others to give to Indian education a more practical bent, such as will contribute towards the development of the arts and industries of the country. It may confidently be asserted that the introduction of a sound system of educational Handwork in schools will go far to remedy this defect.

While it is true that in a certain number of Indian schools the kindergarten system is in use, it is rarely followed up by an organized course of hand and eye training in the other classes of the schools. The subject being thus, so far as India is concerned, very little known, we consider it desirable to state clearly the objects to be aimed at in any course of hand and eye training in schools, and to suggest the lines on which this special branch of school work should be carried out. For the same reason we shall endeavour to describe in some detail the nature of some of the exercises by which this training may be given.

Aims of school Handwork

The object of all such exercises is to train the eye to accuracy and rapidity in observation, and the hand to skill in execution, to develop the inventive powers of the mind, and to inculcate a sense of the importance of truthfulness in work. The exercises also teach the children not only to observe, but to interpret what they observe and to describe it. They cultivate habits of neatness, of orderly arrangement, of accuracy in measurement, of attention to small and apparently trifling details—habits which cannot fail to be of use to the children in after-life, no matter what may be the trades, professions, or occupations in which they may be engaged, or the positions which they may have to fill

Courses in hand and eye training have the further advantage of providing a series of educational exercises especially useful for children of the class which may be described as the less 'bookish' class; to such children these exercises give a chance of excelling, by giving them something to do which they may be able to do well, while they are at the same time a boon to those children who are over-keen on book study by affording a healthy change of occupation. Experience has shown that Handwork has, in addition to its many direct advantages, the effect of arousing dull children to an earnest and often successful effort to overcome the difficulties that retard their progress in the other branches of school work.

As to the results of the introduction of hand and eye training courses, it cannot but be regarded as strong proof of the usefulness of this branch of school work, that the testimony of those who have had a personal experience of schools, both before and after hand and eye training exercises were introduced, is altogether to the effect that not only have the hand and eye training exercises been effective in developing accuracy, industry, and self-reliance, but that they have contributed notably to the improvement of the work of the school all round. This is not the opinion only of those engaged in teaching the subject, who might be supposed to take an unduly favourable view of the results of their own special work in the schools, but is that of inspectors and headmasters One inspector says: 'It makes the children alert, it is entirely a training of the intelligence and there is no getting off with guess work, it cultivates the power of rapid and exact observation; it makes the children from the very first attach greater importance to exactness; it develops the inventive faculty; it is a relief to the children by varying the nature of their school work; refreshed and brightened by it, they have greater zest for their book work; it has been found an effectual check for nervousness. It gives the dull child the chance of getting on to the same plane with smarter children, and thus gives to dull children a useful incentive to exertion in the other work of the school; the exercises in it are the most popular with pupils, it thus helps in keeping up the attendances in the school.'

Results

An excellent proof of the value of Manual Training is that wherever it has been introduced, it has been continued and extended and there has been no disposition to go back to the old system of primary education which was almost exclusively literary in its character.

The question of who should teach this subject is one which has given rise to considerable controversy.

The teacher

When the movement first began in Europe artisans were almost exclusively employed to teach Manual Training in schools Experience showed that many failed to achieve sound educational results on account of lack of training in methods of teaching Doubtless the technical skill of the artisan is greater than that of the class-teacher, but just as it is not always the most skilled artist or musician who is the best teacher of his art, so the skilled workman is not necessarily a good teacher

It is necessary to point out the danger likely to result from this branch of school work being taken up by incompetent teachers, especially by those who do not appreciate or understand its educational aims. Misled by the apparent simplicity of the exercises, and thinking that the work can be taught without previous study or preparation, they are content to adopt the easiest methods. The children are then drilled to perform the exercises with a certain mechanical accuracy, and in this way the educational value of Hand-work is greatly diminished. Real teachers are needed, they must be skilled in handicraft but they must also understand something of education and teaching methods. In British and American training institutions students may specialize along certain lines. Those who desire to do so are required—in addition to their ordinary studies—to give special time to the subjects in which they wish to specialize and to be examined in these subjects.

The method generally followed in British secondary schools is to have on the staff a specialist who is responsible for all the Handwork occupations in the school. He himself carries on the manual instruction of the higher classes, and supervises and directs the hand and eye training taught by the class-teachers in the lower departments of the school. In outlying districts, where the schools are small, one specialist frequently undertakes the educational Handwork and supervision of several schools spending, say, two days a week in each, again it is not uncommon for the Drawing master in a small secondary school to teach and be responsible for the Manual Training as well as Drawing.

Hand and eye training has its part to play in supplementing the instruction in other branches of school work, e.g. Drawing is closely connected with most forms of hand and eye training, and along with these exercises Arithmetic too may be taught and illustrated.

Correlation with other school studies

Clay modelling, which usually comes at a very early stage, may be used to illustrate, among other things, the Nature-study and Geography lessons. It will be found that if used to illustrate the answers to common questions in Geography, such as 'What is meant by an island? an isthmus? a peninsula? a cape? etc.' the children readily understand the terms, and can intelligently explain them.

Paper cutting and folding may be associated with elementary Geometry and Arithmetic. By means of cardboard modelling many practical illustrations of advanced geometrical and mathematical statements may be given.

Wood- and metal-work should be closely associated with scale drawing, freehand sketching, and science work. Many simple pieces of science apparatus can be made by the boys; for example, an angle-mirror frame, a bridge for specific gravity experiments, and a test-tube stand as illustrated in plate No. VI. In connexion with the lessons on materials used, woodwork may be associated with Geography—in describing where different varieties of timber are found, teaching ports of shipment, etc. Metal-work may be related to the Science work by lessons on the constituent parts and properties of iron, copper, brass, etc.

School garden work provides an excellent opportunity for experimental Nature-study, and may also be associated with the woodwork classes.

Materials

A great variety of materials have been used for educational Handwork exercises. For the junior classes up to the age of twelve years, paper, clay, cardboard, and light woodwork, have been most commonly used; while for the senior classes, work in wood and metal and combinations of these, together with practical gardening, have proved most suitable

The late Otto Salomon, the founder of the Sloyd movement in Sweden, was of opinion that the fewer materials used the better. He says, 'No teacher can teach what he does not understand, and it cannot be expected that a class-teacher should understand every or even several kinds of Handwork. The more branches he takes up the less will be his dexterity in each.' The following are some of his suggestions for the selection of materials.

1. The materials used should accord with the capabilities of the children.
2. They should allow of cleanliness and neatness, and should be faultless from an hygienic point of view.

3. They should excite and sustain interest, and be such as will cultivate the sense of form.
4. They should be inexpensive, and such as the children can use in their homes.

For Indian schools, courses in paper, clay, weaving, cardboard, wood and metal, and school gardening, are suggested.

In some British schools considerable thought has been given to experiments with the weaving of raffia and of coloured yarns, and enough has been accomplished to show that these materials afford opportunity for profitable activity. Two years ago the writer visited an important London school and saw the children weaving simple cloth patterns on a primitive loom. It is suggested to Indian teachers that this might prove a profitable subject of study and experiment. From yarns and raffia, small rugs, mats, and cloths are woven, and by the use of coloured yarn many simple designs may be produced.

It is difficult and undesirable to prescribe courses, or to speak with certainty of the exact form and content which Manual Training should assume in Indian schools. The work will vary in different districts and schools according to their location and equipment. Local industries should be considered in determining the particular kind of Manual Training to be given. For example, in a district where the leading industry is metalwork it would be a wise thing to have training in metalwork given; where woodworking is the chief industry, training in woodwork would seem desirable; not that we wish to give to educational Handwork an industrial bias, but rather because we wish to make use of the things with which the pupils are familiar.

It is impossible within the limits of this article to give courses in detail, but a brief description of several of the courses which have been suggested for Indian schools will now be given.

PAPER FOLDING AND CUTTING

These exercises are intended to help the children to appreciate form and may be readily associated with Arithmetic. Different forms will be compared and contrasted and for this purpose squares, rectangles, triangles, should be made by folding and cutting out (see plate No. I), the children being led to compare the figures, to observe their proportions and the difference between them, and to express as far as they can that difference in their own words.

Preliminary exercises in the use of the ruler and scissors are necessary, to assume a knowledge of these is to make a false start.

As an example of how the exercises may be associated with the work in Arithmetic a lesson may be given as follows —

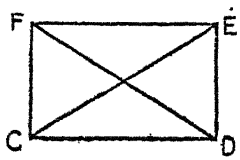


Fig. 1.

Construct the rectangle *CDEF*. Ask children to examine the figure and get them to see that it has four sides, four angles—all right angles, opposite sides equal; join opposite corners, and measure the lengths of each of the lines; give the name *diagonals*, measure and write down the lengths of *CF*, *FE*, and *CE*; state how much longer *CF* + *FE* is than the

diagonal *CE*. Fold *CD* to *FE* to get the longer diameter, and *CF* to *DE* to get the shorter diameter; measure both and state the difference. Measure and state the size of the sum of all the edges; give the name *perimeter*. Cut along the line *CE* and compare the triangles.

Or the rectangle may be taught as follows fold a four-inch square along one of its diameters, cut into two equal parts; give the name *rectangle*. Measure the opposite edges of one of the parts, and make a statement about them Test the angles with a set-square and make a statement regarding them Divide the edges of each part into inches and join each point to the one opposite. How many spaces have you got? What shape are they? How many square inches? Cut them out; using the squares you have cut, make a rectangle 5 inches long and 3 inches broad. How many squares does it contain?

Further practice may be given in constructing rectangles of various sizes by means of the square inches cut from the original figure. The squares may also be used as exercises in comparison, e.g. place two one-inch squares together, compare these with two inches square, note that two inches square contain four square inches, while two one-inch squares contain two square inches; similarly three square inches may be compared with three inches square, and so on.

Pattern-making is another form of paper-cutting; for this work we may use coloured paper which, after being cut to the required forms, is mounted on squared paper so as to make simple patterns. After working through the examples illustrated on plate No. II the children may be allowed to construct patterns of their own.

Pattern-making

PAPER MODELLING

The teacher is advised to construct models for any scheme he intends to teach. By so doing he will be able to anticipate the difficulties likely to arise in the class. A complete set of the models to be made may be exhibited in the classroom. This will arouse interest and industry.

The children should be encouraged to talk about the shape and colour of the models and to take the necessary measurements; this will enable the teacher to associate the work with Geometry and Arithmetic. The models may be made to accompany and grow out of a scheme of lessons on common objects, history, or literature, etc. A lesson on snow, for instance, may be allied to the making of a sledge, a snow-shoe, ski, an Esquimau hut. A lesson on the wind might be accompanied by the making of a wind-mill, a weather-vane, a kite. A lesson on farming suggests a hen-coop, barn, dove-cot, troughs, milk-pail, etc. Schools near a river or a sea-port might make boats of various forms, and correct representations of the flags of various steamship lines. Or the work of a class may be centred on a special group of things such as 'shelters', from which we should get tents of various kinds: sentry-box, dog-kennel, bee-hive, rabbit-hutch, a hut, signal-box, etc. Or on 'seats', such as stools of various shapes, chairs, benches, couches, and so on. In the upper primary classes the boys might make many articles which would be of service to themselves or the school generally, such as strong brown-paper envelopes, models of things useful in object-lessons, cardboard boxes to

contain specimens for the museum, etc. Originality on the part of the teacher and pupils is the very essence of the work.

In the primary classes the necessary drawings may be copied from a dimensioned drawing on the blackboard directly on to the paper or cardboard which pupils are to use; in the middle classes the pupils may make dimensioned sketches from the teacher's model. It is essential that the principles underlying the 'developments' of the models should be understood from the earliest stages, so that the pupils may acquire the knowledge necessary to carry out original ideas. Simply to work mechanically through a set of exercises, without understanding the principles, is to grasp the shadow and lose the substance. Every stage should mean not merely the production of a set of models, but the application of a principle of construction capable of adaptation to a wide range of objects. The mental process involved in the actual development of a model, however simple, will quicken the intelligence and is a greater educational force than even skilful manipulation of tools and materials.

Drawings

CLAY MODELLING

Modelling in clay is a valuable form of hand and eye training suitable alike for the youngest as well as for the highest classes. It may be closely allied to the Nature-study lessons, and is calculated to arouse interest in all forms of ornament and sculpture, while as a means of developing the senses of form and touch it cannot be equalled.

A variety of materials have been used in the teaching of modelling, such as wax, plasticine, and clay; of these the last two are commonly used in European schools. Of late years plasticine has become very popular on account of its cleanliness and because it does not get hard or dry; it is expensive, and not always obtainable in India. Ordinary potter's clay, on the other hand, is easy to obtain, cheap, and, if properly looked after and periodically treated with an antiseptic, is quite satisfactory. The clay should be kept in a covered zinc-lined box, and after use it should be covered with a waterproof sheet to retain the moisture.

Tools are seldom necessary for school modelling, and their use should be discouraged; they may be used occasionally to put in the veining of a leaf, or to get at a corner, but as a rule the work should be sufficiently large to allow of its being done by the fingers Mechanical methods such as rolling or flattening on the modelling-board should be avoided. The surface modelled should not be rubbed or polished to make it smooth; when the form is good, fingermarks add to the appearance of the work.

The softness of the material makes the attainment of accuracy less easy than in paper or cardboard work, but the lack of accuracy is balanced by the greater variety of form which may be studied, the rapidity with which results may be obtained, and by the endless possibilities of improvement. Clay is never spoilt by a wrong touch: it can be corrected and worked over indefinitely.

In the infant classes modelling may alternate with paper-folding. Children should be encouraged to work from their imagination, for example, they may illustrate by means of clay figures the characters of a story told by the

teacher. Children delight in such work, and, though the results may seem poor to an adult, to them the rudest form with four legs becomes a horse, a cow, a dog, etc. Soon, however, their sense of form begins to develop, and they see that their animals and figures are not like real ones; after many attempts to make them realistic, they become discouraged and lose interest. Consequently, about the age of seven years, when some power of handling the clay and of seeing correctly have been gained, definite instruction should be given in the use of the material, the aim being to develop accuracy of observation, muscular control, and an appreciation of form and proportion.

These aims may be best attained by giving (1) only such exercises as are within the capacity of the children, and (2) only good and attractive models for their study. The latter is most important, for the eye like the ear must be educated so that it will not be satisfied with poor form.

The subjects of study may be classed generally under two heads: natural forms and manufactured objects, a judicious balance should be maintained between these two, and the exercises should be graded and arranged to follow each other in a progressive course. For Nature-study, select large and simple forms and where possible show the manner of growth, e g. leaves, seed-pods, and fruits should be modelled showing a portion of the twig on which they grew

We have said that this form of Handwork is also suitable for the senior classes; and the following is an outline of a course suitable for such classes or for students in training colleges.

To model—

1 *In the round.*

(a) Nature forms: pomegranate, tomato, orange, apple, potato, pear, seed-pods, turnip, mango, fish, etc.

(b) Manufactured objects: watch, hammer, cotton bobbin, electrical globe, loaf, Indian shoe, book, shells (various).

2. *In relief.*

(a) Nature forms: leaves, e.g. jaman, pipal, mango, etc. Flowers, e.g. narcissus, pansy, rose and spray of leaves, etc.; feet of birds and animals, etc

(b) Manufactured objects: horse-shoe, scissors, keys, huqqa, tools, plane, saw, etc.; shields, Indian and European.

3. *In Geography.*

Relief maps, sections, geological strata.

NOTE —When modelling in relief there is a common tendency to flatness; special attention should therefore be directed to the heights of the various parts in relation to each other.

CARDBOARD MODELLING

Cardboard modelling is suitable for the upper primary classes; it follows naturally from the paper-work of the lower school and should be governed by the same broad principles Drawing is an essential part of the work, and dimensioned working drawings should be made before the models are begun. Plate No. V shows what may be done in constructive work.

Cardboard work may be associated with Arithmetic and Geometry, e.g. exercises may be given involving the calculation of the amount of material

used in making the models, or the relationship between the volumes of corresponding geometrical solids may be simply deduced. For example, if a cone and a cylinder be constructed having equal bases and equal axes, and are then filled with sand, it can be shown that the volume of the former is one-third that of the latter. A pyramid and the corresponding prism may be treated similarly.

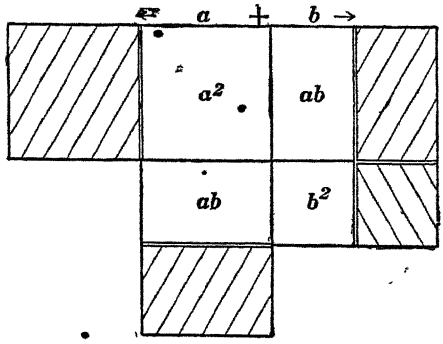
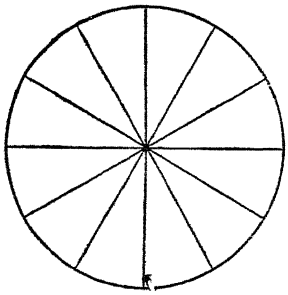


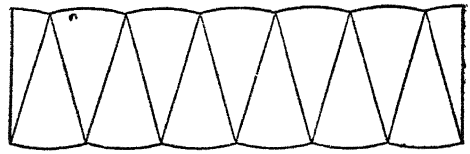
Fig. 2.

Again, it may be shown that (1) $(a+b)^2 = a^2 + 2ab + b^2$. Let $a = 3''$, $b = 2''$. Construct the figure in cardboard; cut out the shaded portions, and secure by binding strips as shown.

(2) *The area of a circle is equal to* πr^2. Construct and cut out a circle of 6 inches diameter; divide into twelve parts.

Cut out the parts and place side by side as shown. Divide last sector into two, and place one-half at each end.


Fig. 3


Fig. 4

(3) *The square on the hypotenuse of any right-angled triangle is equal to the sum of the squares on the other two sides.*

Construct and cut out eight triangles each equal to the given triangle.

Place four of these triangles as shown in Fig 5 and complete the square *EFGH*.

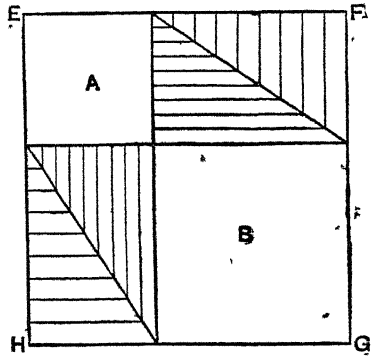


Fig. 5.

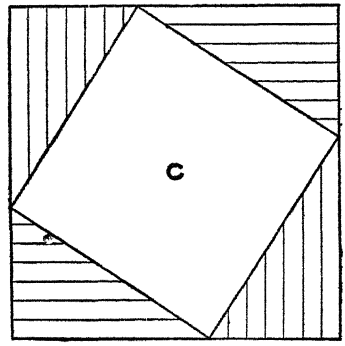


Fig. 6.

The figure *A* is equal to the square on the short side of triangle, *B* is equal to the square on the long side.

Arrange the remaining four triangles as in Fig. 6; the enclosed figure *C* is equal to the square on the hypotenuse of the given triangle.

Place Fig 5 on top of Fig. 6, and show that they are equal. Take from each the four equal triangles, and the remainders are equal

Figure *C*, the square on the hypotenuse equals $A + B$, the sum of the squares on the other two sides.

WOODWORK

In the primary classes the pupil has learnt how to use and work with paper, clay, and cardboard, and now he is about to use harder material. New tools requiring greater strength and skill are to be employed, the skilful manipulation of which will tax his powers of body and mind.

There is a consensus of opinion that wood affords the most suitable material as a basis for Manual Training exercises. Experiments have been made and are still being made with different materials in order to determine their suitability or otherwise as mediums for this work, but it is doubtful if anything better than wood can be found as a suitable medium for such training; the ease with which it can be cut, its cleanliness while being worked, the accuracy which can be secured, the number of varieties available, and the opportunity it affords of using a large range of tools, mark it out as superior to most other materials. Wood also lends itself to the arrangement of graduated courses of exercises which for variety of tool operations, tests of accuracy, and scope for original work, cannot be excelled. Further, the excellent opportunities for object-lessons which woodwork affords should not be overlooked; such lessons will include a description of the growth and structure of wood, the sources from which the several varieties are obtained, methods of transport, processes of seasoning, diseases to which it is liable, and the different methods of preservation.

Lessons on tools—the materials from which they are made, their cost, methods of sharpening and keeping them in working order, the mechanical principles involved in their use, all come within the range of woodwork; while lessons on Drawing, such as the various systems of projection, scale drawing and sketching, are included. The preparation of working drawings is an important part of the work; drawing-boards, T-squares, and set-squares should be provided and lessons on their use should be given.

Courses

The courses should be progressive in difficulty, each new model so far as possible involving the use of either a new tool or another variety of timber. The earlier models should be such as may be made with few tools; in the Swedish system the first few models are made by a knife only. As the course progresses new tools and manipulations should be introduced one by one, and their construction considered with reference to the particular operations they are fitted to perform

The pupils should be taught to consider the suitability of the different timbers for the work in hand. Is it of the right degree of hardness or softness for the work to be done? The harder woods should come late in the course.

The models should be such as the pupils can make without help and they should be complete in themselves ; joints are necessary, but they should be parts of models and not given as abstract exercises ; see half-lap joint used in making the spinning-top (Plate VI).

Careful exact work should be required, and before passing a model the teacher should be satisfied that it is as accurate as the pupil can make it. Inaccurate work should not be covered up by the use of glue or sandpaper.

While the aim is the same in all schools the models will vary, e.g. in country schools it is desirable to make models which may be used in agriculture. 'The general principle by which we should be guided is that the series of models made in the school should give the best expression to objects needed at home or in the district' (Salomon). The work should not, as a rule, be polished or painted

The course in woodwork usually extends over two or three years, one weekly lesson of one and a half to two hours being given. A shorter period than this is undesirable. The number of pupils under one teacher should not, as a rule, exceed twenty. The pupils should be encouraged to rely on themselves to carry out the work in hand, and find out for themselves the best way of using tools and appliances. After a fair mastery of tools and material has been acquired, pupils should be encouraged to work on original lines. They should be provided with special notebooks in which to make rough sketches, and keep notes of the lessons given on tools and materials. Although it is desirable to have accurately prepared and fully dimensioned scale drawings made for most of the work, it should be remembered that the drawing is only a means to an end, and that over-elaboration, either by the multiplication of unnecessary views or the preparation of difficult sections, should be avoided. After the pupils have acquired a knowledge of how to use the T- and set-squares in drawing simple plans and elevations, they should be taught to make drawings direct from a model. In practice a workman frequently works from a dimensioned sketch, not necessarily drawn to scale, but in fair proportion ; so it is advisable sometimes to allow the pupils to make dimensioned sketches, and to work from these alone. Measurements need not be confined to feet and inches, the metric scale may also be employed.

Separate sheets for drawing are preferable to books , they should be kept in portfolios, or large envelopes, which the boys may make themselves. Care should be taken to *print* all headings ; measurements should be clearly indicated between dimension lines The drawings should also show a statement of the kind and quantity of material necessary for the work in hand, and it is a useful exercise to require the pupil to calculate the cubic content of the material used, and its cost at local rates. Thus :

Cost of wood, including waste wood, @ Rs 2/8 per cub ft			= Rs.
Cost of nails, screws, glue, glass-paper, etc.	..	..	= Rs.
Cost of labour : * hours @ Rs. 2/- per hour	..	..	= Rs.
		Total	= Rs

The Manual Training room

It should be remembered when designing a Manual Training room that the physical exertion necessary in this subject and the consequent discharge of waste matter from the body requires that the room should be airy and well ventilated. A plan is given (p. 248) showing how the room may be arranged.

The size of the room will be determined by the number of pupils for whom provision must be made; as a rule twenty boys may be taken by one teacher. In many centres in Great Britain forty boys are taken at a time, in that case it is necessary to have two qualified teachers. The room should be lit from one side—the north—and should additional light be necessary it may be got by roof-lights facing north.

Assuming that the room is designed for twenty boys, the benches should be placed so as to have their ends facing towards the windows. A central passage and a passage at each side of the room are required; the spaces between the benches should be at least 3 feet wide. There should be a distance of about 8 feet between the benches and the teacher's demonstration bench. Provision should also be made for drawing-desks, a teacher's desk, and a blackboard.

Benches and tool-racks may be made in various ways, and for each some special advantage is claimed. Frequently the benches and tool-racks are combined, the tools being either stored in special presses under the benches or on racks constructed above them. A suitable arrangement is to have special tool-racks placed between the benches (see plan). This arrangement has the following advantages:—

Fittings

1. The tools are easily got at by the pupils.
2. It makes supervision by the teacher easy.
3. Missing tools are at once detected.
4. Racks are not in scholars' way while at work.

Water.—A water-tub and tap or a special lavatory should be provided, so that the pupils may wash their hands after completing a model and before beginning to draw.

Benches.—The benches should be strongly and soundly constructed; they should be fitted with cast steel instantaneous grip vices; wood screw vices may be cheap, but they are inefficient. A suitable size for a dual bench is 4 feet 6 inches by 2 feet 6 inches, and the height should range from 2 feet 4 inches to 2 feet 7 inches to suit the boys; if possible they should be fitted with drawers, so that each boy may have one in which to keep his drawings and unfinished work.

Tool-racks.—The tool-racks should be large enough to hold the bench tools of four boys

Almirahs.—Several almirahs should be provided, one of which should have a glass front so that specimens of finished work may be exhibited, and one should be fitted for the storing of special tools.

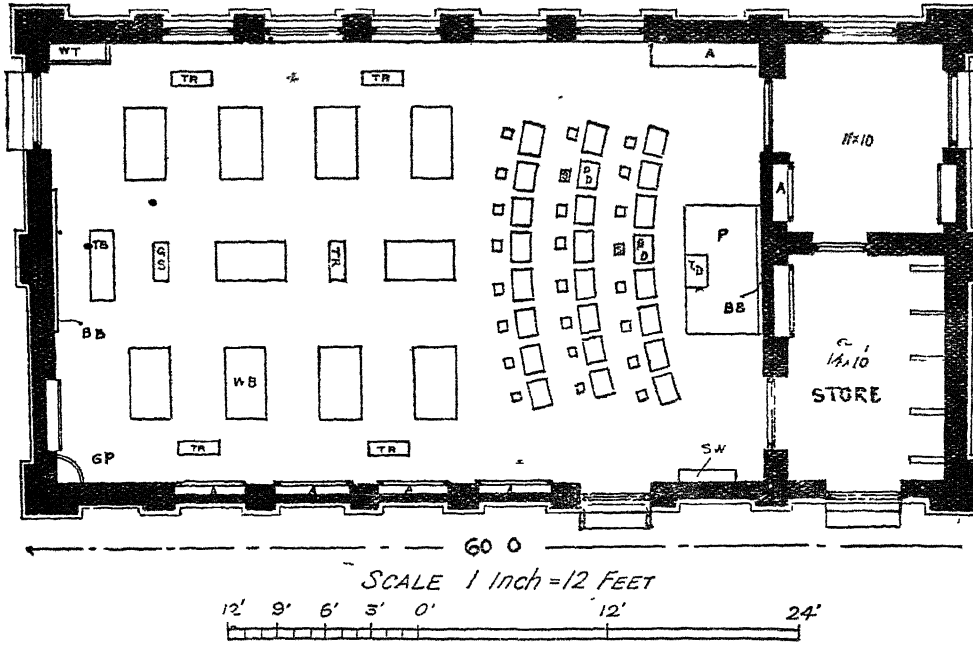
A collection of specimens of the different kinds of timber used in the district should be made. These, after being properly labelled and classified, will be used during the lessons on the growth and structure of timber.

A simple ambulance outfit.—A simple ambulance outfit, consisting of a roll of 2 inch cotton bandage, a bottle of carbolic oil, and new skin, should be in every manual room, so that in case of accident simple remedies may be at hand.

Drawing-desks.—The drawing-desks should have hinged lids, so that drawing-boards, T- and set-squares may be kept in them, stools should be provided. The desks should be about 2 feet 10 inches high, and the tops should have a slope of about 15 degrees. A good-sized blackboard should be provided and a platform on which the demonstration bench may be placed.

Store room.—A store room in which timber and materials may be kept is necessary. Round two of the walls iron bars should be fitted at intervals, so that the timber may be placed on end or horizontally as desired; shelving should be placed round the remaining walls for nails, glue, metal, and sundries.

Teacher's room.—A small room should be provided for the teacher's use simply furnished, and having an almirah for stationery, etc.

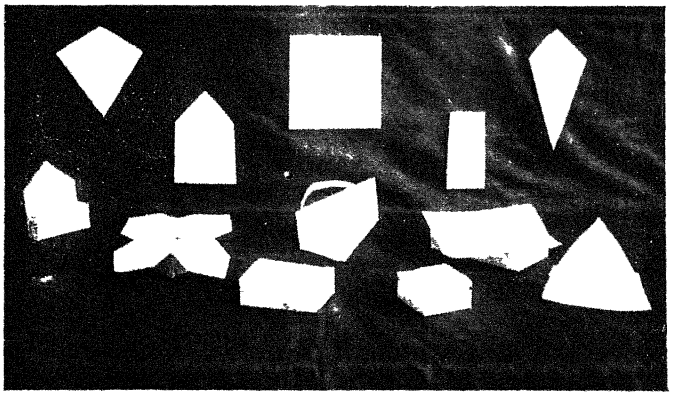


PLAN OF MANUAL TRAINING ROOM

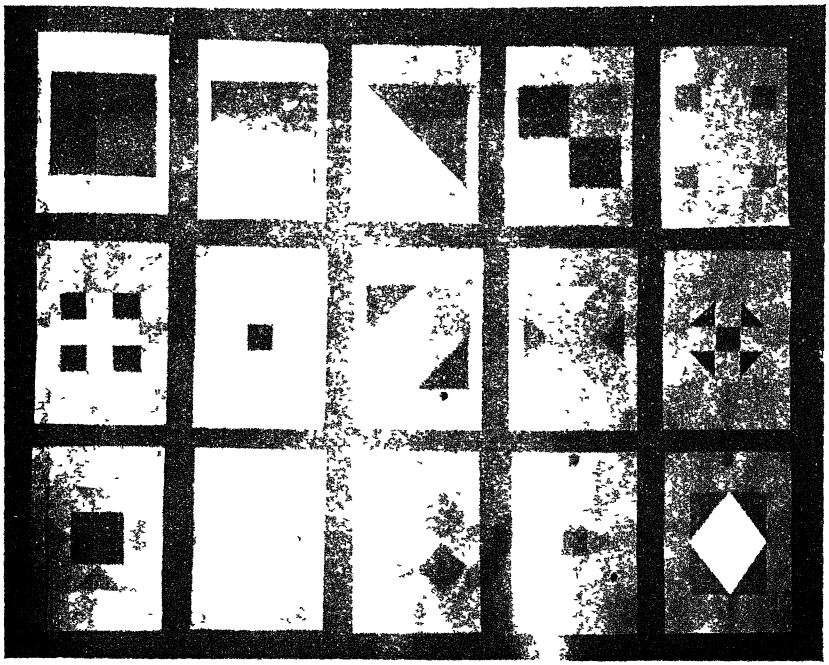
P. Platform T D Teacher's Desk B.B Blackboard D D Drawing-Desk S Stool
T B Teacher's Bench W T Water-Tub A Almirah G S Grinding Stone
W B Work Benches S W Specimens of Work T R Tool-Racks G P Glue Pot

The centre system

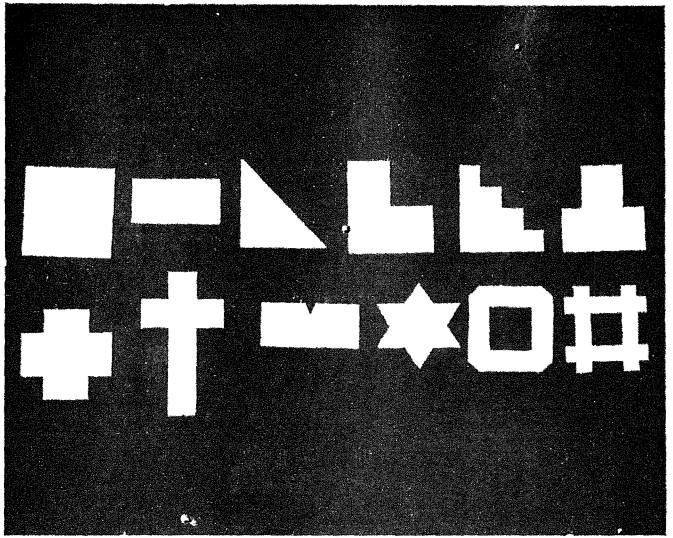
In large towns in Great Britain, most modern secondary schools have a well-equipped Manual Training room as part of the school building. In older schools, where the necessary accommodation was not available, special buildings have been erected to meet the requirements of the Education Department. To provide every school with a special manual room was impossible on account of the expense, and this gave rise to the 'centre' system, whereby a room, suitably equipped for instruction in wood- or metal-work, is made available for several neighbouring schools. This room is in constant use all the week, both morning and afternoon. Classes of boys from the schools concerned have the use of the 'centre' in turn, and each class receives instruction from the special teacher. The 'centres' are fitted for classes of either twenty or forty boys, thus four to six hundred boys may receive instruction weekly. The 'centre' system might with advantage be adopted in the larger Indian cities. In the



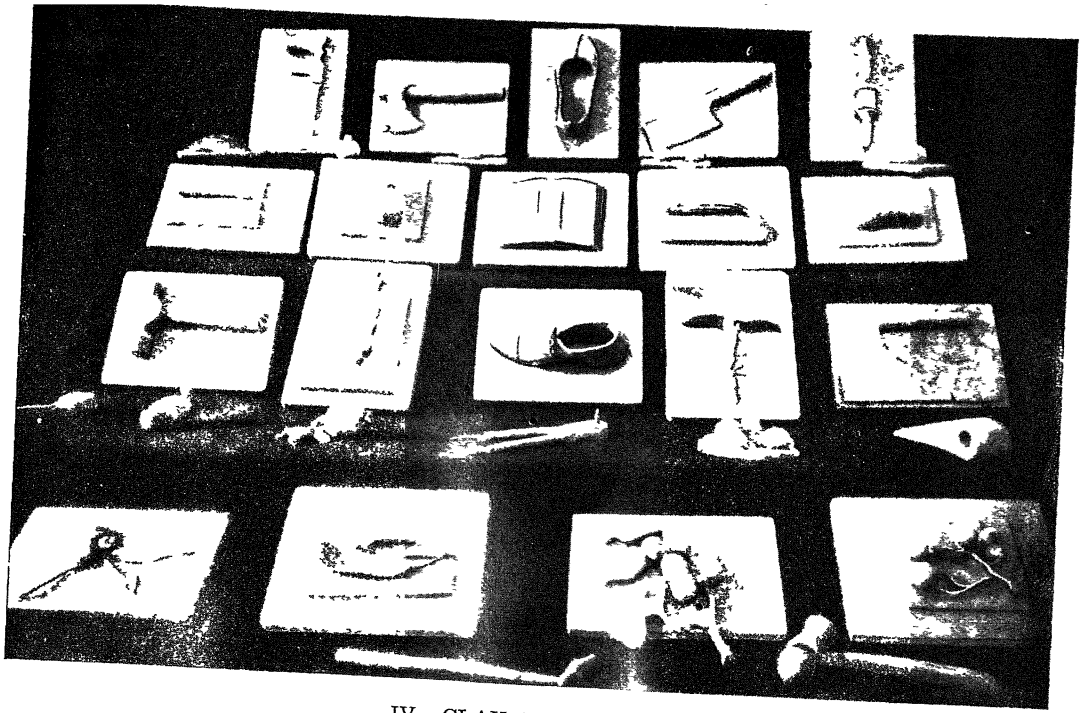
I PAPER FOLDING AND CUTTING



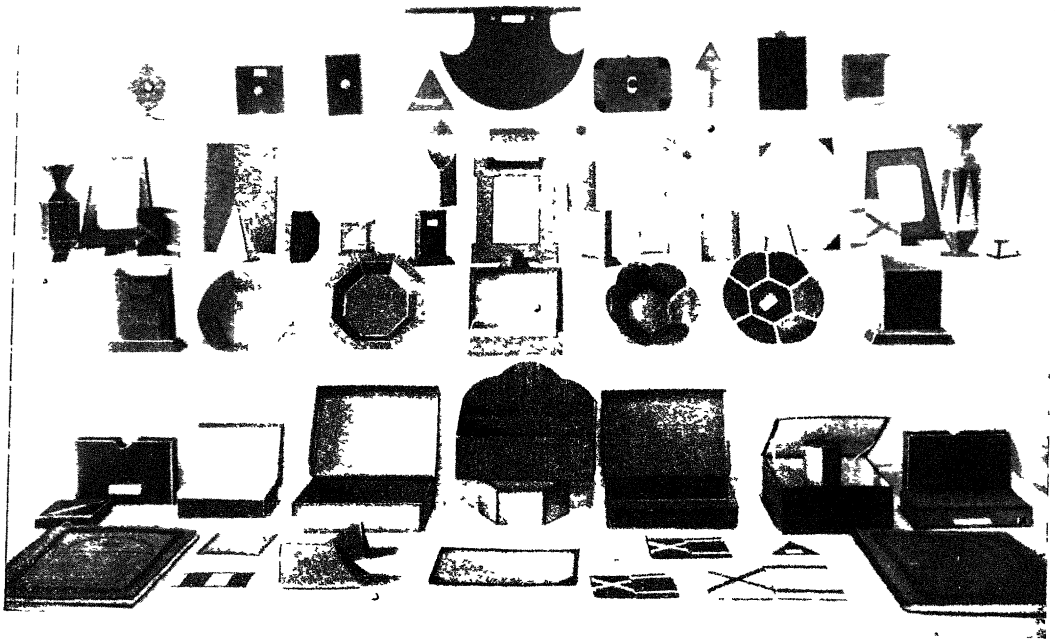
II. PATTERN-MAKING



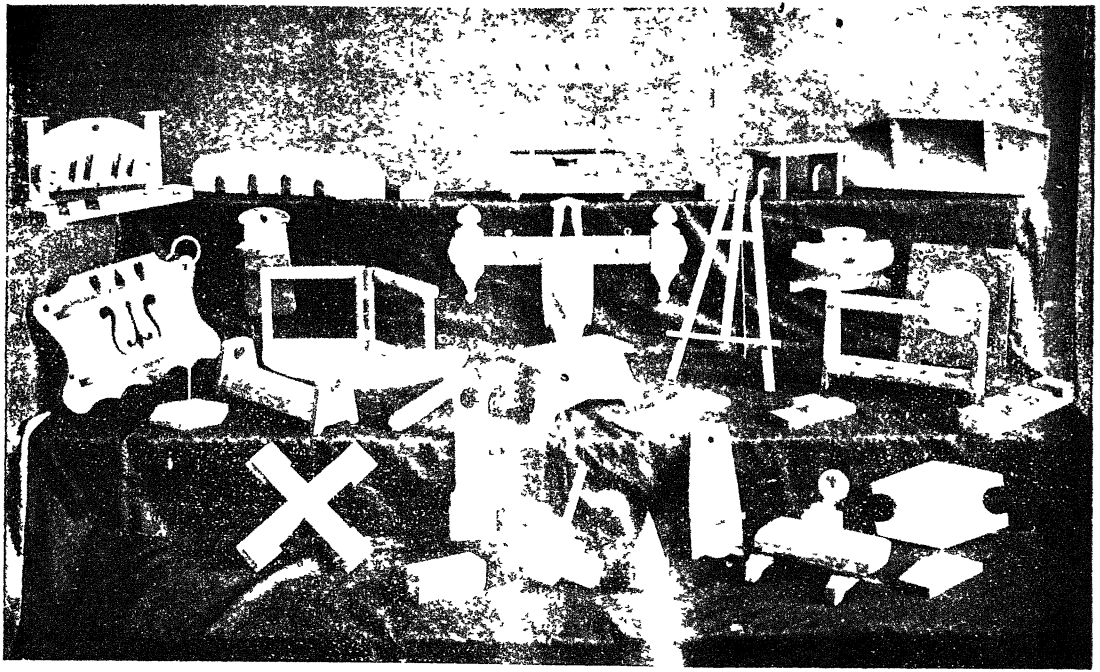
III PAPER MODELLING



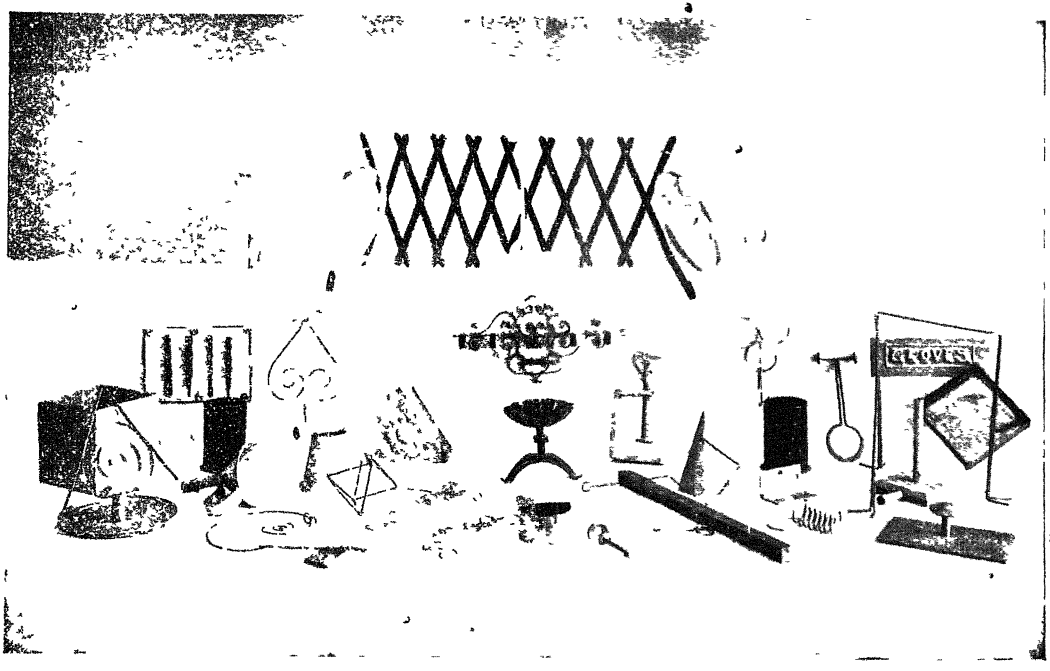
IV CLAY MODELLING



V CARDBOARD MODELLING



VI WOODWORK



VII METALWORK

rural districts the introduction of Manual Training is more difficult; nevertheless many country schools in Britain do manage to equip an inexpensive building, and let us hope that once the educational value of this subject is understood, many public-spirited citizens of India will be found willing to provide the necessary funds for the equipment of local Manual Training rooms. In the early days of the movement in Britain and America, a great impetus was given by the benevolence of wealthy citizens.

METALWORK

While it is true that woodwork forms in some respects the most suitable basis for Manual Training, excellent courses in metalwork may be arranged either alone or in combination with woodwork. In the plate on metalwork, several kinds of work are illustrated, e.g. wire-bending and soldering, bent iron work, zinc and tinplate work, forging, tempering, and repoussé work. This last is very popular among the more advanced woodwork pupils, copper hinges and fittings being made and decorated by them for their woodwork models.

As an example of how simple and inexpensive pieces of science apparatus may be made, a tripod stand and bunsen burner are shown in Plate VII, these were made at a cost of about six annas. The tripod was made from three pieces of iron wire 24 inches long bent to the form shown and bound together by fine wire. The bunsen burner was made from a piece of tin plate 9 inches long by $1\frac{1}{4}$ inches, bent so as to form a cylinder and soldered. The base is a piece of wood $3 \times 3 \times \frac{3}{4}$ inches

As in woodwork, Drawing should form an important part of the work, and many instructive lessons may be given on the tools and materials used.

The cost of a fully equipped metalwork room will run from Rs. 3000 to Rs. 4000, but a school course may begin with a much less expensive outfit.

SCHOOL GARDENS

This form of Manual Training has become very popular in village schools in some parts of Britain; and, being closely associated with Nature-study, it may be made a subject of great educational value Teachers in Indian village schools, where the cost of equipment and materials necessary for wood or metalwork may be prohibitive, might put this less expensive form of educational Handwork to the test. Nature-study as now taught is almost wholly observational, and up to a certain point this is good and satisfactory. After the age of about ten, however, boys cease to be satisfied with the acquisition of information for its own sake, and it is here that the garden will provide an outlet for their activities.

The pupils can be allowed to prepare the ground, sow the seed, do their own weeding, etc., keeping a careful record of the dates on which the various operations were performed. They may sketch characteristic parts of plants in bud, flower, leaf, and stem, take notes at various stages of their growth, so that if required they may write an account of a flower or fruit, etc., and illustrate their essay by sketches, thus cultivating their powers of observation, comparison, and judgement. This will give new life to both Drawing and Nature-study lessons.

In the garden the pupils will learn methods of planting, watering, weeding, thinning, and transplanting, of fertilizing and cultivating the soil, and they may make a study of seed vessels, bulbs, roots, etc , of annuals, biennials, and perennials, and become interested in and acquainted with the actual processes of growth and life.

The garden, too, may provide a *hobby* for many in after-life Knowing the great pleasure men of various professions take in their gardens, interest in which has come to them often by chance, we are assured that the time is well spent in giving schoolchildren opportunities for acquiring a taste for gardening ; to train them to make good use of their leisure is not the least important of the functions of the school.

A tool-shed containing a carpenter's bench and a few simple tools is necessary, and sufficient vacant ground should be left round it for the class to stand together with the teacher, while he discusses the work in hand.

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